

SOIL SURVEY

Duplin County North Carolina



UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION

How to use THE SOIL SURVEY REPORT

THIS SURVEY of Duplin County will help you plan the kind of farming that will protect your soils and provide good yields. It describes the soils; shows their location on a map; and tells what they will do under different kinds of management.

Find Your Farm on the Map

In using this survey, start with the soil map, which consists of the 65 sheets bound in the back of this report. These sheets, if laid together, make a large photographic map of the county as it looks from an airplane. You can see woods, fields, roads, rivers, and many other landmarks on this map.

To find your farm on the large map, use the index to map sheets. This is a small map of the county on which numbered rectangles have been drawn to show where each sheet of the large map is located.

When you have found the map sheet for your farm, you will notice that boundaries of the soils have been outlined, and that there is a symbol for each kind of soil. All areas marked with the same symbol are the same kind of soil, wherever they appear on the map.

Suppose you have found on your farm an area marked with the symbol Na. You learn the name of the soil this symbol represents by looking at the map legend. The symbol Na identifies Norfolk fine sandy loam, nearly level phase.

Learn About the Soils on Your Farm

Norfolk fine sandy loam, nearly level phase, and all the other soils mapped are described in the section Description of the Soils. Soil scientists, as they walked over the fields and through the woodlands, described and mapped the soils. They dug holes and examined surface soils and subsoils; measured slopes with a hand level; noted differences in growth of

crops, weeds, brush, or trees; and, in fact, recorded all the things about the soils that they believed might affect their suitability for farming.

After they mapped and studied the soils, the scientists judged what use and management each soil should have, and then they placed it in a capability unit. Soils in a capability unit are similar and they need and respond to about the same kind of management.

Norfolk fine sandy loam, nearly level phase, is in capability unit I-1. Turn to the section Use and Management of Soils and read what is said about soils in this capability unit. You will want to study the table which tells you how much you can expect to harvest from Norfolk fine sandy loam, nearly level phase, under two levels of management. In columns A are yields to be expected under prevailing management, and in columns B are yields to be expected under improved management.

Make a Farm Plan

For the soils on your farm, compare your yields and farm practices with those given in this report. Look at your fields for signs of runoff and erosion. Then decide whether or not you need to change your methods. The choice, of course, must be yours. This survey will aid you in planning new methods, but it is not a plan of management for your farm or any other farm in the county.

If you find that you need help in farm planning, consult the local representative of the Soil Conservation Service or the county agricultural agent. Members of the staff of your State agricultural experiment station and others familiar with farming in your county will also be glad to help you.

The fieldwork for this survey was completed in 1954. Unless otherwise specifically noted, all statements refer to conditions at the time of the survey.

Contents

	Page		Page		Page
Soil survey methods and definitions.....	1	Soils of Duplin County—Continued		Soils of Duplin County—Continued	
General description of the county.....	2	Description of the soils—Continued		Description of the soils—Continued	
Location and extent.....	2	Goldsboro series.....	16	Myatt series.....	25
Organization and population.....	2	Goldsboro fine sandy loam:		Myatt fine sandy loam.....	25
Physiography, relief, and drainage.....	2	Nearly level phase.....	16	Myatt loamy fine sand.....	25
Coharie terrace.....	3	Gently sloping phase.....	17	Norfolk series.....	25
Sunderland terrace.....	3	Goldsboro loamy fine sand:		Norfolk fine sandy loam:	
Wicomico terrace.....	3	Nearly level thick surface		Nearly level phase.....	25
Chowan terrace.....	4	phase.....	17	Gently sloping phase.....	25
Climate.....	4	Gently sloping thick surface		Eroded gently sloping phase.....	25
Water supply.....	5	phase.....	17	Sloping phase.....	26
Vegetation.....	5	Immokalee series.....	17	Eroded sloping phase.....	26
Industries.....	5	Immokalee fine sand.....	17	Norfolk loamy fine sand:	
Transportation and markets.....	5	Izagara series.....	17	Nearly level thick surface	
Improvements and community fa-		Izagara fine sandy loam.....	17	phase.....	26
cilities.....	5	Johnston series.....	17	Gently sloping thick surface	
Agriculture.....	6	Johnston loam.....	18	phase.....	26
Agricultural practices.....	6	Kalmia series.....	18	Sloping thick surface phase.....	26
Land use.....	6	Kalmia fine sandy loam.....	18	Okenee series.....	26
Farm crops.....	6	Kenansville series.....	18	Okenee loam.....	26
Livestock.....	7	Kenansville fine sandy loam:		Okenee fine sandy loam.....	26
Soils of Duplin County.....	7	Nearly level phase.....	18	Ona series.....	27
General soil areas.....	7	Gently sloping phase.....	18	Ona fine sand.....	27
Soils grouped according to natural		Kenansville loamy fine sand:		Ona loamy fine sand.....	27
drainage.....	8	Nearly level thick surface		Pamlico series.....	27
Description of the soils.....	8	phase.....	19	Pamlico muck.....	27
Bayboro series.....	8	Gently sloping thick surface		Pamlico muck, shallow phase.....	27
Bayboro loam.....	8	phase.....	19	Plummer series.....	28
Bladen series.....	9	Klej series.....	19	Plummer fine sand.....	28
Bladen silt loam.....	9	Klej fine sand.....	19	Plummer fine sand, terrace	
Bladen fine sandy loam.....	11	Klej fine sand, terrace phase.....	19	phase.....	28
Caroline series.....	11	Klej loamy fine sand.....	19	Plummer loamy fine sand.....	28
Caroline fine sandy loam:		Lakeland series.....	19	Pocomoke series.....	28
Gently sloping phase.....	11	Lakeland fine sand:		Pocomoke loam.....	28
Eroded gently sloping phase.....	11	Nearly level phase.....	19	Portsmouth series.....	28
Sloping phase.....	11	Gently sloping phase.....	20	Portsmouth loam.....	28
Eroded sloping phase.....	11	Sloping phase.....	20	Portsmouth mucky loam.....	29
Strongly sloping phase.....	11	Strongly sloping phase.....	20	Rains series.....	29
Caroline-Lakeland complex.....	11	Nearly level shallow phase.....	20	Rains fine sandy loam.....	29
Gently sloping phases.....	12	Gently sloping shallow phase.....	20	Rains loamy fine sand, thick	
Sloping phases.....	12	Sloping shallow phase.....	20	surface phase.....	29
Strongly sloping phases.....	12	Terrace phase.....	21	Ruston series.....	29
Coxville series.....	12	Lakeland loamy fine sand:		Ruston fine sandy loam:	
Coxville fine sandy loam.....	12	Nearly level phase.....	21	Nearly level phase.....	29
Sandy clay subsoil phase.....	12	Gently sloping phase.....	21	Gently sloping phase.....	30
Craven series.....	12	Lenoir series.....	21	Eroded gently sloping phase.....	30
Craven fine sandy loam:		Lenoir fine sandy loam.....	21	Sloping phase.....	30
Nearly level phase.....	12	Leon series.....	21	Eroded sloping phase.....	30
Gently sloping phase.....	13	Leon fine sand.....	22	Eroded strongly sloping	
Eroded gently sloping phase.....	13	Lynchburg series.....	22	phase.....	31
Eroded sloping phase.....	13	Lynchburg fine sandy loam.....	22	Ruston loamy fine sand:	
Dragston series.....	13	Lynchburg loamy fine sand,		Nearly level thick surface	
Dragston fine sandy loam.....	13	thick surface phase.....	22	phase.....	31
Dragston loamy fine sand, thick		Magnolia series.....	22	Gently sloping thick surface	
surface phase.....	14	Magnolia loamy fine sand:		phase.....	31
Dunbar series.....	14	Nearly level thick surface		Sloping thick surface phase.....	31
Dunbar fine sandy loam.....	14	phase.....	23	Strongly sloping thick sur-	
Duplin series.....	15	Gently sloping thick surface		face phase.....	31
Duplin fine sandy loam:		phase.....	23	Rutledge series.....	31
Nearly level phase.....	15	Magnolia fine sandy loam:		Rutledge loam.....	31
Gently sloping phase.....	15	Eroded gently sloping phase.....	23	Rutledge loam, thick surface	
Eustis series.....	15	Eroded sloping phase.....	23	phase.....	31
Eustis loamy fine sand:		Marlboro series.....	23	Rutledge loamy fine sand.....	31
Nearly level phase.....	15	Marlboro fine sandy loam:		Rutledge mucky loam, thick sur-	
Gently sloping phase.....	15	Nearly level phase.....	23	face phase.....	32
Fallsington series.....	15	Gently sloping phase.....	24	St. Johns series.....	32
Fallsington fine sandy loam.....	16	Eroded gently sloping phase.....	24	St. Johns loamy fine sand.....	32
Galestown series.....	16	Mixed alluvial land.....	24	Stough series.....	32
Galestown fine sand:		Mixed alluvial land, poorly		Stough fine sandy loam.....	32
Nearly level phase.....	16	drained.....	24	Stough loamy fine sand, thick	
Gently sloping phase.....	16	Mixed local alluvial land.....	24	surface phase.....	32
				Swamp.....	32

	Page		Page		Page
Soils of Duplin County—Continued		Use and management of soils—Con.		Morphology, genesis, and classification	
Description of the soils—Continued		Capability groups of soils—Con.		of soils—Continued	
Woodstown series.....	33	Management by capability units—		Classification—Continued	
Woodstown fine sandy loam:		Continued		Intrazonal soils—Continued	
Nearly level phase.....	33	IVs-1.....	40	Low-Humic Gley soils inter-	
Gently sloping phase.....	33	VIIw-1.....	40	grading to Gray-Brown Pod-	
Woodstown loamy fine sand,		VIIIs-1.....	40	zolic soils.....	49
nearly level thick surface		Estimated yields.....	40	Ground-Water Podzol soils....	50
phase.....	33	Morphology, genesis, and classification		Bog soils.....	50
Use and management of soils.....	33	of soils.....	41	Azonal soils.....	50
Capability groups of soils.....	33	Factors of soil formation.....	41	Regosols.....	51
Management by capability units..	34	Parent material.....	41	Regosols associated with Red-	
I-1.....	35	Climate.....	41	Yellow Podzolic soils.....	51
IIe-1.....	35	Plant and animal life.....	41	Regosols associated with Gray-	
IIe-2.....	35	Relief.....	46	Brown Podzolic soils.....	51
IIw-1.....	35	Time.....	46	Regosols with restricted drain-	
IIw-2.....	36	Classification.....	46	age.....	51
IIw-3.....	36	Zonal soils.....	46	Engineering applications.....	51
IIIs-1.....	36	Red-Yellow Podzolic soils.....	46	Soil science terminology.....	54
IIIe-1.....	37	Red-Yellow Podzolic soils inter-		Soil test data and engineering soil	
IIIe-2.....	37	grading to Low-Humic Gley		classifications.....	54
IIIw-1.....	37	soils.....	47	Soil test data.....	54
IIIw-2.....	38	Gray-Brown Podzolic soils inter-		Engineering classification sys-	
IIIw-3.....	38	grading to Low-Humic Gley		tems.....	54
IIIw-4.....	38	soils.....	48	Soil engineering data and recom-	
IIIs-1.....	39	Intrazonal soils.....	48	mendations.....	54
IVe-1.....	39	Humic Gley soils.....	48	Drainage systems and farm ponds...	67
IVw-1.....	39	Low-Humic Gley soils.....	49	Detailed soils investigations for	
IVw-2.....	39	Low-Humic Gley soils inter-		earth construction.....	67
IVw-3.....	40	grading to Red-Yellow Pod-		Glossary.....	68
		zolic soils.....	49	Literature cited.....	69

Series 1954, No. 2

Issued—March 1959

Goldston, Eugene Frizzell, 1905—

Soil survey, Duplin County, North Carolina [by E. F. Goldston, Dwight L. Kaster, and J. A. King. Correlation by G. H. Robinson. Washington, U. S. Govt. Print. Off., 1958.

ii, 75 p. illus., maps (part fold. col.) 28 cm. (U. S. Soil Conservation Service. Soil survey, ser. 1954, no. 2)

Cover title.

"In cooperation with North Carolina Agricultural Experiment Station."

"Literature cited" : p. 69.

1. Soil-surveys—North Carolina—Duplin Co. (Series)
[S591.A22 ser. 1954, no. 2] 631.47 Agr. 58-386

U. S. Dept. of Agr. Libr. 1S032F 1954, no. 2
for Library of Congress

SOIL SURVEY OF DUPLIN COUNTY, NORTH CAROLINA¹

By E. F. GOLDSTON, in Charge, and DWIGHT L. KASTER, North Carolina Agricultural Experiment Station, and J. A. KING, Soil Conservation Service

Correlation by G. H. ROBINSON, United States Department of Agriculture

United States Department of Agriculture, Soil Conservation Service, in Cooperation With the North Carolina Agricultural Experiment Station

Soil Survey Methods and Definitions

The scientist who makes a soil survey examines soils in the field, classifies the soils in accordance with facts that he observes, and maps their boundaries on an aerial photograph or other map.

FIELD STUDY.—The soil surveyor bores or digs many holes to see what the soils are like. The holes are not spaced in a regular pattern, but are located according to the lay of the land. Usually they are not more than a quarter of a mile apart and sometimes they are much closer. In most soils such examination reveals several distinct layers, called horizons, which collectively are known as the soil profile. Each layer is studied to see how it differs from others in the profile and to learn the things about this soil that influence its capacity to support plant growth.

Color is usually related to the amount of organic matter in soils of the same texture and clay mineralogy. The darker the surface soils, the more organic matter they contain. Streaks and spots of gray, yellow, and brown in the lower layers generally indicate poor drainage and poor aeration.

Texture, or the content of sand, silt, and clay, is first determined by the way the soil feels when rubbed between the fingers, and in some cases it is later checked by laboratory analysis. In a general way texture determines how well the soil retains moisture, plant nutrients, and fertilizer, and whether it is easy or difficult to cultivate.

Structure, which is the way the individual soil particles are arranged in larger grains and the amount of pore space between grains, gives us clues to the ease or difficulty with which the soil is penetrated by plant roots and by moisture.

Consistence, or the tendency of the soil to crumble or to stick together, indicates whether the soil is easy or difficult to keep open and porous under cultivation.

Other characteristics observed in the course of the field study and considered in classifying the soil include the following: The depth of the soil over bedrock or compact layers; the presence of gravel or stones in amounts that will interfere with cultivation; the steepness and pattern of slopes; the degree of erosion; the nature of the underlying parent material from which the soil has developed; and acidity or alkalinity of the soil as measured by

chemical tests. Many terms used in the report are defined in the glossary.

CLASSIFICATION.—On the basis of the characteristics observed by the survey team or determined by laboratory tests, soils are classified by series, types, and phases.

As an example of soil classification, consider the Magnolia series. In Duplin County, this series is made up of two soil types, subdivided into phases, as follows.

Series	Type	Phase
Magnolia.....	Loamy fine sand....	{ Nearly level thick surface phase. Gently sloping thick surface phase.
	Fine sandy loam....	{ Eroded gently sloping phase. Eroded sloping phase.

Soil series.—Two or more soil types that differ in surface texture but that are otherwise similar in kind, thickness, and arrangement of soil layers are normally designated as a soil series. In a given area, however, it frequently happens that a soil series is represented by only one soil type. Each series is named for a place near which it was first mapped.

Soil type.—Soils having the same texture in the surface layers and similar in kind, thickness, and arrangement of other layers are classified as one soil type. The soil type is the basic classification unit.

Soil phase.—Because of differences other than those of kind, thickness, and arrangement of layers, some soil types are divided into two or more phases. Slope variations, frequency of rock outcrops, degree of erosion, depth of soil over the substratum, or natural drainage are examples of characteristics that suggest dividing a soil type into phases.

The soil phase (or the soil type if it has not been subdivided) is the unit shown on the soil map. It is the unit that has the narrowest range of characteristics. Use and management practices therefore can be specified more easily than for soil series or yet broader groups that contain more variation.

Miscellaneous land types.—Fresh stream deposits or rough, stony, and severely gullied land that have little true soil are not classified into types and series; they are identified by descriptive names, such as Mixed local alluvial land.

¹ James E. Caudle, Soil Conservation Service, assisted in writing this report.

Soil complex.—When two or more soils are so intricately associated in small areas that it is not feasible to show them separately on the soil map, they are mapped together and called a soil complex. An example of this is the Caroline-Lakeland complex.

General Description of the County

Duplin County is in the Coastal Plain province of North Carolina. The relief is nearly level and gently rolling. The principal crops are tobacco, corn, cotton, market vegetables, small fruits, soybeans, potatoes, forage, and hay. Beef and dairy cattle are raised in small numbers, but large numbers of hogs are produced for market and home use. Forest industries supplement agriculture.

Location and Extent

Duplin County is in the southeastern part of North Carolina. Kenansville, the county seat, is north of Wilmington and southwest of Greenville. Distances by air from Kenansville to principal cities in the State are shown in figure 1. The area of the county is 526,080 acres or about 822 square miles.

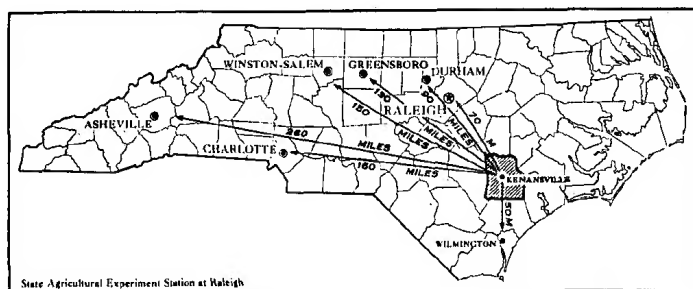


Figure 1.—Location of Duplin County in North Carolina.

Organization and Population

Duplin County was formed from New Hanover County in 1749 and named in honor of George Henry Hay, Lord Duplin. The land that included Duplin County was granted to Lord Granville. A group of people from Ulster, in Ireland, was brought in by Henry McCulloch, Lord Granville's agent, to settle the land. The first white settlement in Duplin County was made about 1737 near the village of Sarecta (9)². Settlers also came from the English and the Scottish settlements on the lower Cape Fear River, from Pennsylvania, Maryland, and Virginia, and from England (7).

From 1775 to 1780 the County seat was called Duplin Court House but the location was not specified. Kenansville has been the county seat since January 1819. It was named for James Kenan, who opposed the Stamp Act and became an official of the county and a trustee of the University of North Carolina (14).

According to the 1950 census, the total population of Duplin County was 41,074. The farm population was

² Italic numbers in parentheses refer to Literature Cited.

26,987, and the nonfarm population was 14,087. The population is fairly well distributed over the county, except for a few areas that are not particularly well suited to farming. The sparsely populated areas are the sandhills in west-central Duplin County and the wet flatlands along the Onslow and Pender County lines.

Physiography, Relief, and Drainage

Duplin County lies entirely within the Coastal Plain physiographic province. The northwestern part of the county is in the middle Coastal Plain; the southern and eastern parts are in the lower Coastal Plain, or flatwoods. The boundary between the two parts runs generally from southwest to northeast. In some places this boundary is clearly defined by marine terrace escarpments, but in others there is no distinct line of separation.

The land is nearly level to gently sloping. Slopes rarely exceed 5 percent, except on breaks of streams or on the escarpments that separate marine terraces from one another. The more rolling land is mostly in the middle Coastal Plain in the northwestern part of the county. From the northwest toward the southeast, slopes become progressively more nearly level, land elevation is less, and drainage is poorer.

The lowest elevation in the county is 20 feet at the point where the Northeast Cape Fear River flows out. The highest reported elevation is 167 feet at Bowden.

Because of the relatively flat topography, much of the upland is poorly drained. Even the well-drained soils become very wet, and during rainy periods water stands on the fields or in the furrows. Bottom lands are nearly all very poorly drained and swampy. They are covered by water much of the time and are very wet, even during prolonged dry weather. Creeks and branches occur in many sections of the county. Where there are no natural drainageways, ditches generally contain water during wet weather but are empty in dry weather.

The greater part of the county is drained by the Northeast Cape Fear River and its tributaries. The main tributaries of this river are Doctors, Maxwell, Muddy, Limestone, and Grove Creeks, and Goshen Swamp. A small area in the western part near Warsaw and Carrol is drained by Stewarts Creek and by Turkey Swamp.

A few sinkholes occur on the Wicomico terrace in the vicinity of Chinquapin and on the Sunderland terrace in the vicinity of Magnolia. They were formed through the dissolution of underlying limestone and marl and the caving in of the surface. The Bottomless Wells of Magnolia are of this origin.

Depressed areas known as Carolina Bays are common over the county but are most numerous in the western and northern parts. They are shallow elliptic or oval-shaped depressions with outer rims of sandy material. Their long diameter usually runs from northwest to southeast, and the sandy rims are usually developed best on the southeastern side. Lengths of the depressions vary from about a few hundred feet to nearly a mile. Many theories have been advanced regarding the origin of the bays, one of them being the meteoric theory (8).

The land surface of the county is made up of four marine terraces (see glossary) (2)—the Coharie, Sunderland, Wicomico, and Chowan (fig. 2). All of the surficial geological formations are unconsolidated sands and clays that com-

prise the Columbia group of Pleistocene age. Each formation has the same name as the terrace whose surface it forms.

Sunderland terrace.—The Sunderland terrace is a nearly level plain and is the second largest of the terrace plains in Duplin County. It is exceeded in size only by the Wicomico terrace. The northwestern boundary of the Sunderland terrace is the sea-facing escarpment previously described as the southeastern border of the Coharie terrace. The Sunderland terrace is separated from the adjacent lower lying Wicomico terrace by a fairly well defined escarpment. Along the reentrants from the Wicomico that extend up the valleys of the principal streams, the two terrace plains are separated by well-defined escarpments.

The Sunderland terrace slopes southeastward from an elevation of about 150 feet at its northwestern boundary to an elevation of about 100 to 110 feet near the edge of the escarpment that forms its southeastern boundary with the Wicomico terrace. Places on the Sunderland terrace have the following elevations: Bowden, 167 feet; Warsaw, 159; Magnolia, 138; and Kenansville, 127. It is possible that the places of higher elevation are remains of the Coharie terrace.

Stream dissection is slight and is confined largely to Goshen Swamp, to the headwaters of the Northeast Cape Fear River, and to short tributaries of these streams. The dissolution of the underlying limestone has formed a few sinkholes, the most notable of which are the so-called Bottomless Wells near Magnolia. Because of the nearly level slopes, runoff is slow, and fairly large areas of poorly drained and of imperfectly drained soils occur on the interstream flats. Stream gradients are low, and the bottom lands are mostly very poorly drained and swampy.

The Sunderland geological formation forms the surface of this terrace. Like that of the Coharie formation, it consists of unconsolidated clays, sands, and gravel. The materials in the Sunderland formation, however, are somewhat finer. The gravel occurs mostly in basal beds and is rarely on the surface.

Wicomico terrace.—The Wicomico terrace is nearly level and is the largest of the terrace plains in Duplin County. Except for the small area of the lower lying Chowan terrace, it occupies all of the county east and south of the Sunderland terrace. From an elevation of about 100 feet at the base of the escarpment that separates it from the Sunderland terrace, it slopes toward the south and east to an elevation of about 50 feet, where it joins the Chowan terrace. Places on this terrace have the following elevations: Rose Hill, 87 feet; Teachey's, 71; Beulaville, 94; Pin Hook, 60; Cedar Fork, 80; and Potters Hill, 120.

The Wicomico terrace is drained by the Northeast Cape Fear River and its tributaries. The topography is youthful, and differences in elevation between stream bottoms and the adjacent uplands are slight. Stream gradients are low, and all the bottom lands are wet and swampy. On some of the broad interstream flats, there are extensive areas of swamp land, locally known as pocosins, savannas, or bays. The largest of these swamps is Angola Bay, lying in the southern part of the county and extending into Pender County.

The Wicomico geological formation forms the surface of this terrace; it consists of unconsolidated clays, sands, and gravel. It is similar to the geological formation of the Sunderland terrace. The finer materials are dominant; little or no gravel is on the surface.

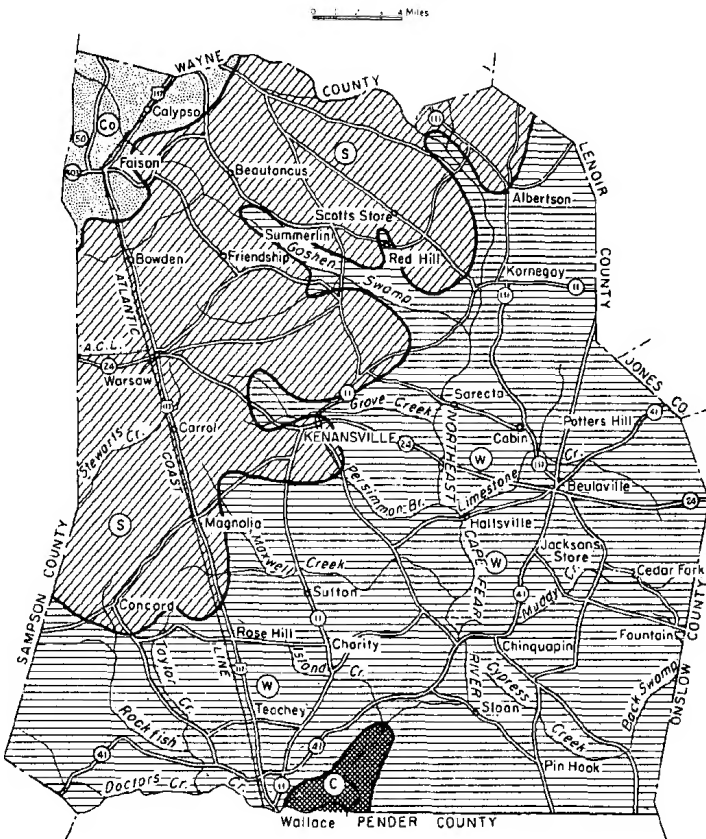


Figure 2.—Physiography and drainage map showing coastal plain terraces: Co, Coharie terrace; S, Sunderland terrace; W, Wicomico terrace; and C, Chowan terrace.

Coharie terrace.—The Coharie terrace occupies a small area in the northwestern part of Duplin County. Places on Coharie terrace have the following elevations: Calypso, 166.6 feet; and Faison, 166.4. As a rule, gradients are gently sloping but are steeper along stream breaks and terrace escarpments. Interstream areas in some places are nearly level.

The soils have been developed from the unconsolidated sands, clays, and gravel of the Coharie formation that forms the Coharie terrace. This formation is more sandy than the lower lying and younger formations that cover the other terraces in the county. For this reason, the soils on the Coharie terrace are generally well drained. Exceptions are bottom lands along streams that are poorly drained and the interstream flats, some of which are imperfectly drained to poorly drained.

To the southeast, a sea-facing escarpment separates the Coharie from the lower lying Sunderland terrace. In places this escarpment is sharply defined; at other points the change from one terrace to the other is so gradual that the escarpment is not distinct. A reentrant from the Sunderland terrace plain extends up Goshen Creek into the Coharie. Along this reentrant, the two terraces are separated by sharply defined scarps.

Some sinkholes are present in the vicinity of Chinquapin and to the northwest and southeast of this community.

Chowan terrace.—The Chowan terrace is a small triangular area lying along each side of the Northeast Cape Fear River in the southern part of the county. It is the upper part of a reentrant along this stream. The base of the triangular area is about 10 miles wide; the upstream apex of the triangle is 10 or 12 miles north of the county line. The point of lowest elevation in the county is on the Chowan terrace. Elevations range up to about 45 feet at the base of the escarpment that separates the Chowan terrace from the Wicomico terrace.

The Chowan terrace, like the Wicomico, is a nearly level plain. Nearly all of its area is poorly or imperfectly drained.

The Chowan geological formation forms the surface of this terrace. It is very much like the Wicomico formation and consists of unconsolidated clays, sands, and gravel. No gravel appears on the surface.

Climate

The Atlantic Ocean and other bodies of water tend to reduce daily and seasonal changes in temperatures in Duplin County. Contrary to the prevailing impression, the Gulf Stream has little effect on the climate of eastern

North Carolina, because the stream is separated from the coast by 50 miles of comparatively cold water, and the prevailing winds are from the southwest. Temperature and precipitation data compiled from United States Weather Bureau records are given in table 1.

Precipitation and temperature are uniform throughout the county. The summers are long and commonly have short periods of very hot weather. Winters are usually short and warm, and freezing weather is not very common. The weather is generally humid; rainfall is plentiful and well distributed throughout the year. Short droughts occasionally injure crops and interfere with transplanting. Snow is very unusual and rarely remains on the ground for more than 24 hours. Ice storms occasionally damage trees and communication and power lines. The average frost-free season is from April 9 to November 1, a period of 206 days. The latest recorded killing frost in spring was April 25, and the earliest in fall was October 9.

The chances of a killing freeze (4) at Willard, N. C., which is in Pender County just across the Duplin County line, are as follows:

In spring after March 27, 9 in 10; after April 4, 3 in 4; after April 10, 1 in 2; after April 15, 1 in 4; and after April 23, 1 in 10. In fall before October 14, 1 in 10; before October 25, 1 in 4; before November 1, 1 in 2; before November 10, 3 in 4; and before November 14, 9 in 10.

TABLE 1.—*Temperature and precipitation, Sloan, Duplin County, N. C.*

[Elevation, 50 feet]

Month	Temperature ¹			Precipitation ²			
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1931)	Wettest year (1922)	Average snowfall
	^{°F.}	^{°F.}	^{°F.}	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
December.....	45.9	85	4	3.49	4.75	6.30	0.3
January.....	46.3	85	1	3.49	1.86	3.85	.7
February.....	46.4	86	1	3.92	.79	4.59	1.5
Winter.....	46.2	86	1	10.90	7.40	14.74	2.5
March.....	53.8	94	11	3.81	2.71	6.58	.3
April.....	60.6	96	26	2.88	1.14	1.69	.1
May.....	68.7	100	33	4.30	3.00	10.50	(³)
Spring.....	61.0	100	11	10.99	6.85	18.77	.4
June.....	75.7	105	41	5.58	3.07	8.04	0
July.....	78.5	104	48	7.39	7.74	12.32	0
August.....	77.7	102	50	6.05	5.58	10.96	0
Summer.....	77.3	105	41	19.02	16.39	31.32	0
September.....	73.4	101	38	4.83	2.90	1.52	0
October.....	62.9	95	24	3.14	.30	8.34	0
November.....	53.1	88	14	2.38	1.57	1.81	(³)
Fall.....	63.1	101	14	10.35	4.77	11.67	(³)
Year.....	61.9	105	1	51.26	35.41	76.50	2.9

¹ Average temperature based on a 58-year record, through 1952; highest and lowest temperatures on a 56-year record, through 1952.

² Average precipitation based on a 61-year record, through 1955; wettest and driest years based on a 59-year record, in the period 1893-1955; snowfall, based on a 57-year record, through 1952.

³ Trace.

Water Supply

Many streams are in Duplin County, but some of the smaller ones flow only in wet weather. Most of the larger streams flow through wide areas of bottom land that are swampy and covered by water much of the time. Goshen Swamp and parts of the Northeast Cape Fear River have several channels through which water flows most of the time. All of the streams in the county flow slowly and often overflow surrounding lands. A few streams could be used for irrigation where the channels are near the upland. In some of the smaller streams, ponds have been built for the production of fish and for irrigation. Sites are available for many more ponds. Streams in the county are silted because of soil erosion on the uplands. In addition, streams are obstructed by logs and tree tops lodged in channels through improper lumbering operations in the bottom lands.

Well water is available throughout the county from wells that are mostly 25 feet or less in depth. Flowing wells in the swamps and on the uplands provide a good supply of water. Many flowing wells in the southern part of the county are less than 100 feet deep, but on the upland many are 200 feet deep. The discharge from selected wells in the county is as follows (5): At Faison a well 200 feet deep and 8 inches in diameter yields 90 gallons per minute; another well of the same dimensions yields 50 gallons per minute; at Kenansville a well 198 feet deep and 8 inches in diameter yields 200 gallons per minute; at Rose Hill a well 186 feet deep and 8 inches in diameter yields 150 gallons per minute; at Wallace a well 150 feet deep and 10 inches in diameter yields 100 gallons per minute; at Warsaw two wells, each about 110 feet deep and 8 inches in diameter, yield 60 gallons and 80 gallons per minute. A well near Rose Hill, 168 feet deep and 6 inches in diameter, is reported by the owner to flow at the rate of 100 gallons per minute. When pumped, this well yielded 600 gallons per minute for 10 days, and its discharge capacity is estimated to be 615 gallons per minute.

Vegetation

The uplands of Duplin County were covered originally (6) by growths of oak, hickory, dogwood, wild grape, persimmon, and a mixture of pine and shrubs. The low areas along watercourses are either swamp or marsh, and the natural growth of these areas consists of gum, ash, water and white oaks, cypress, poplar, elm, maple, and various kinds of shrubs. Beech, birch, and juniper grow in a few parts of the county, but these trees are scarce.

All of the original timber has been cut. At the present time, only second- and third-growth trees are in the county, and most of these are young and small. The trees are cut as soon as they are large enough for saw logs. Much of the present stand is being cut for pulpwood.

There are three forest types in Duplin County (3). The loblolly pine-hardwood forest type is the most extensive. It is widely distributed because trees of this type have restocked abandoned fields and cutover areas formerly in longleaf pine. The bottom land-hardwoods forest type is next in extent in the county, and it occurs along all major streams. The largest areas of this type are along the Northeast Cape Fear River and along

Goshen Swamp, and they range from $\frac{1}{4}$ mile to 2 miles in width. The pond pine-hardwood type is next in extent. It occurs in the southeastern part of the county in Angola Bay and in small bays in other parts of the county. Angola Bay and the swampland have not been cleared for cultivation and are all in forest.

All land now in cultivation was covered originally by the loblolly pine-hardwood forest type. In the southeastern corner of the county, however, there is a small area of forest that more nearly resembles the longleaf-pine type.

Many kinds of shrubs grow in most forest areas. Angola Bay and some swamps and lesser bays contain more than 20 species of bog-type shrubs. The only native grasses are probably the wiregrass of the forests and broomsedge. Most other grasses growing in the county were imported from other areas.

In the savannalike areas of the northeastern part of the county, orchids, Venus-flytrap, pitcherplant, trumpetplant, grasses, and sedges are growing wild.

Industries

Over one-third of the county is in forest, and the production of forest products is an important enterprise. Other industries are a textile mill at Wallace, pickle plants at Faison, Wallace, and Teachey's, a casket factory at Rose Hill, and a garment factory at Warsaw. Grist and feed mills are operated throughout the county, and a number of tobacco warehouses are at Wallace.

Transportation and Markets

The Atlantic Coast Line Railroad runs through the western part of the county. United States Highway 117, and State Highways 11, 24, 41, 50, and 111 traverse the county. In addition to these major highways, other roads reach all parts of the county except that part within Angola Bay. Most farms are on good roads.

The only tobacco market in the county is in Wallace. Produce markets are in Wallace, Warsaw, and Faison. A livestock auction market is also located in Wallace. The various towns and villages are distribution centers for supplies and for farm products. Corn, soybeans, and other grains are sold in large quantities to local mills for grinding into feed. Poultry products are also traded on a local basis.

Improvements and Community Facilities

Churches and schools in most rural communities are conveniently located. All sections of the county are served by school buses. The schools and churches are available for social gatherings and meetings. Telephone service and electricity are available in many parts of the county, especially in the more densely populated sections. In 1954, the United States Census reported that 414 farms had telephones, 5,245 had electricity, 2,374 had water piped in, 1,663 had home freezers, 137 had cornpickers, 1,538 had motortrucks, 2,534 had tractors, and 3,414 had automobiles.

Agriculture

Since the first white settlement was established in 1737, agriculture has been the principal industry in Duplin County. The early settlers cleared small tracts of land and farmed them until the soil was no longer productive. New land was then cleared, and the old fields were used for pasture or allowed to revert to forest. The practice of clearing new ground when fields wore out continued until recently.

The raising of cattle began early in the history of the county. During the Revolutionary War, armies were reported to have made raids into Duplin County for provisions. The number of cattle declined for many years but has been increasing in the past few years.

Most of the soil suitable for agriculture has been cleared and farmed at one time or another. At present, some areas of good land are in forest. The better soil now in forest could be cleared and cultivated, and some land now in cultivation should revert to forest. Considering its soil resources, Duplin County could support a much larger population.

The principal crops are corn, tobacco, soybeans, oats, wheat, vegetables, and cotton. Corn occupies the greatest acreage, but tobacco dominates in the economy.

Cash and subsistence crops are grown on most farms. There are a few commercial peach orchards in the county. A few other farms also have small orchards, but the trees are in poor condition and are not very productive. Most farmers grow vegetables and potatoes for home use. Nearly all farmers have a small flock of chickens and a few hogs and cattle. Commercial farms produce turkeys, truck crops, dairy products, and beef cattle. Local supplies of milk do not meet the demand.

Agricultural Practices

Cropland is prepared in February or March and planted as soon thereafter as the plants and season will permit. Fall and winter crops are seeded in September and October, but seedbeds are prepared in August and September.

Crop rotations that include water-conserving and soil-building crops are used on about 10 percent of the farms. The use of such crops, however, is increasing. Rye is used as a winter cover crop on many fields where tobacco follows tobacco. The practice of following tobacco with a small grain is increasing. On the very sandy soils, crotalaria is commonly used as a soil-building crop. It is either interplanted with the corn or is used as a crop in the rotation. Tobacco is grown on soils selected for it and is favored over other crops for fertilizer and labor.

Although most of the county has nearly level relief, there are approximately 20,000 acres that would benefit from terracing. Very little land has been terraced, and contour tillage is practiced only to a limited extent. Much of the poorly drained soil has been drained artificially by the use of tile or open ditches, but over most of the area drainage is still inadequate. Soil treatment for the control of nematodes is becoming more common on tobacco lands, but it is considered too expensive for other field crops.

Supplemental irrigation of tobacco fields is practiced to some extent and is expanding rapidly. Other crops

are irrigated also, but only after the needs of tobacco are met.

Commercial fertilizer is used for all crops. Tobacco and truck crops are nearly always fertilized enough to obtain maximum yields. Corn, cotton, and pastures are given lesser amounts of fertilizer and are managed less carefully. Two applications of complete fertilizer or a special topdressing are frequently applied to tobacco. Corn usually gets a complete fertilizer at planting time and a sidedressing of nitrogen. Wheat and oats get only small amounts of fertilizer at planting time, but they are topdressed with nitrogen early in spring.

Lime is applied to nearly all plantings of pasture. Most farmers have their soil tested at the laboratory and follow its recommendations.

Land use

According to the United States census of 1954, there were 5,650 farms in the county. The total farm area was 364,875 acres, or 69.4 percent of the county. In the past 25 years, land in farms and number of farms have gradually increased. Land in farms in 1954 was distributed as follows:

	Acres
Cropland total.....	146,325
Cropland harvested.....	124,991
Cropland used only for pasture.....	9,509
Cropland not harvested and not pastured.....	11,825
Woodland total.....	193,022
Woodland pastured.....	14,563
Woodland not pastured.....	178,459
Other pasture (not cropland and not woodland).....	15,381
Other land (house lots, roads, wasteland, etc.).....	10,147

In 1954, the United States census classified farms by size as follows: Under 10 acres, 576; 10 to 99 acres, 4,188; 100 to 219 acres, 655; 220 to 999 acres, 221; 1,000 acres and more, 10. The average size of the farms is 64.6 acres.

The 5,650 farms reported in Duplin County in 1954 were classified as follows:

	Number
Field crop farms other than vegetable and fruit-and-nut.....	4,454
Cash-grain.....	16
Cotton.....	55
Other field crop.....	4,383
Vegetable farms.....	10
Fruit-and-nut farms.....	45
Dairy farms.....	30
Poultry farms.....	56
Livestock farms other than dairy and poultry.....	213
General farms.....	161
Primarily crop.....	105
Crop and livestock.....	56
Miscellaneous and unclassified farms.....	681

Farm crops

The acreage of the principal crops, as reported by the United States census, is given for stated years in table 2.

Corn is grown on most soils and occupies the largest acreage. It is mostly harvested as grain and used on the farm as feed for poultry and livestock; a small quantity is ground into meal for table use. Very little corn is sold. Average yields in 1954 were about 19 bushels per acre, but the production varies widely, depending on the soil and the management practices used.

Tobacco is grown on many soils, but preferably on the Norfolk, Ruston, Marlboro, Magnolia, Duplin, Goldsboro, and Dunbar soils. It is the leading cash crop, and

its value usually exceeds the combined value of all other crops, livestock, and livestock products. It ranks second in acreage and is grown by nearly all the farmers in the county. Yields averaged about 1,300 pounds per acre in 1954.

Soybeans are grown alone or with other crops on all the tillable soils in the county. About one-fourth of the farmers grew soybeans in 1954. The crop is harvested for seed, hay, or silage, and it may be plowed under as green manure. It is also grazed by cattle and hogs. Yields of seed are low, or about 11 bushels per acre on the average.

TABLE 2.—*Acreage of the principal crops and number of fruit and nut trees and grapevines of bearing age in stated years*

Crop	1939	1949	1954
	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>
Corn harvested for grain.....	62, 585	66, 967	73, 558
Small grains threshed or combined:			
Oats.....	111	325	1, 208
Wheat.....	28	675	1, 300
Rye.....	185	109	158
Barley.....	88	19	77
Soybeans, harvested for beans.....	139	947	2, 428
Hay:			
Timothy and clover.....	5	34	50
Alfalfa.....	12	49	25
Small grains cut for hay.....	547	960	540
Lespedeza.....	146	2, 720	1, 206
Cowpeas.....	⁽¹⁾	546	623
Soybeans.....	⁽¹⁾	1, 883	1, 198
Other tame hay.....	1, 328	1, 979	² 924
Potatoes.....	2, 893	1, 770	² 377
Sweetpotatoes.....	1, 800	1, 069	² 1, 072
Vegetables harvested for sale:			
Green lima beans.....	528	102	36
Snap beans.....	1, 485	1, 809	1, 314
Sweet corn.....	1, 177	1, 350	925
Cucumbers.....	437	752	960
Green peas.....	320	27	2
Sweet peppers and pimientos.....	339	509	786
Squash.....	36	162	113
Watermelons.....	447	166	614
Other vegetables.....	373	570	534
Strawberries.....	1, 881	783	244
Tobacco.....	25, 068	19, 537	22, 196
Cotton.....	5, 192	8, 322	4, 731
Sorghum.....	³ 73	8	416
Fruit and nut trees and vines:	<i>Number</i> ⁴	<i>Number</i> ⁴	<i>Number</i> ⁴
Apple.....	8, 964	2, 353	398
Peach.....	11, 184	3, 869	1, 208
Pear.....	1, 466	452	103
Plum and prune.....	1, 163	401	43
Pecan.....	5, 019	3, 376	1, 260
Grape.....	1, 987	1, 327	283

¹ Not reported.

² Includes wild hay.

³ For sirup.

⁴ Number in census year, which is 1 year later than crop year given at head of column.

Cotton is grown on many different kinds of soil. Yields, however, are best if it is grown on soils that are well drained but not excessively drained. Nearly all the cotton is grown in a relatively small area in the northern part of the county, where it is one of the leading cash crops. For the county as a whole, cotton is not an important crop.

Nearly all the farmers grow vegetables for home use, and many farmers grow them for market. The acreage

used for some truck crops is decreasing. Strawberries are still an important crop in some localities, but the acreage has declined since 1940. Potatoes and sweetpotatoes are grown for home use and for market.

Minor crops are oats, rye, wheat, barley, sorghum, peanuts, cowpeas, and various fruits. Most sorghum cane is made into sirup. Rye is grown largely as a winter cover crop on tobacco land. There are several small commercial peach orchards in the county, and a few farms have peach, apple, pear, and plum trees, and grapevines.

Hay consists mostly of lespedeza, soybeans, and cowpeas. Forage crops, such as fescue and Ladino clover, are also cut for hay. Small acreages of clover and alfalfa are also grown.

Livestock

The numbers of livestock, poultry, and beehives in the county, as reported by the United States census, are shown in table 3.

Thirty farms were classified as dairy farms in 1954. The milk cows are of grade quality, and few farmers own more than one cow. The beef cattle are, for the most part, of grade or scrub quality, but a few Herefords are among the herds.

Swine production is high and is increasing. Poultry is raised throughout the county. Nearly every farm has a few chickens; some have geese, ducks, and turkeys.

TABLE 3.—*Livestock and beehives on farms in stated years*

Livestock and beehives	1940	1950	1954
	<i>Number</i>	<i>Number</i>	<i>Number</i>
Horses and mules.....	¹ 6, 677	7, 437	4, 556
Cattle.....	¹ 5, 114	5, 876	10, 615
Hogs and pigs.....	² 24, 017	44, 177	54, 675
Chickens.....	² 105, 787	² 140, 112	² 188, 008
Turkeys raised.....	³ 2, 123	⁴ 20, 535	91, 716
Beehives.....	778	⁴ 582	⁽⁵⁾

¹ Over 3 months.

² Over 4 months.

³ In 1939.

⁴ In 1949.

⁵ Not reported.

Soils of Duplin County

General Soil Areas

There are three general soil areas in Duplin County. They are (1) mineral soils of Coastal Plain, (2) swamp, and (3) muck (fig. 3).

Mineral soils of Coastal Plain (CP).—This area has a wide range of soil textures and drainage described as follows: (a) Well-drained soils with firm subsoils; sands and loamy sands 18 to 42 inches thick over finer textured material; sandy loam surface materials and friable sandy clay loam subsoils; (b) somewhat poorly drained and poorly drained soils with sandy loam surface materials and friable to firm sandy loam to sandy clay loam subsoils; sands and loamy sands; (c) wet sands.

Swamp (S).—Very poorly drained mixed soils along the Northeast Cape Fear River and Goshen Swamp. These

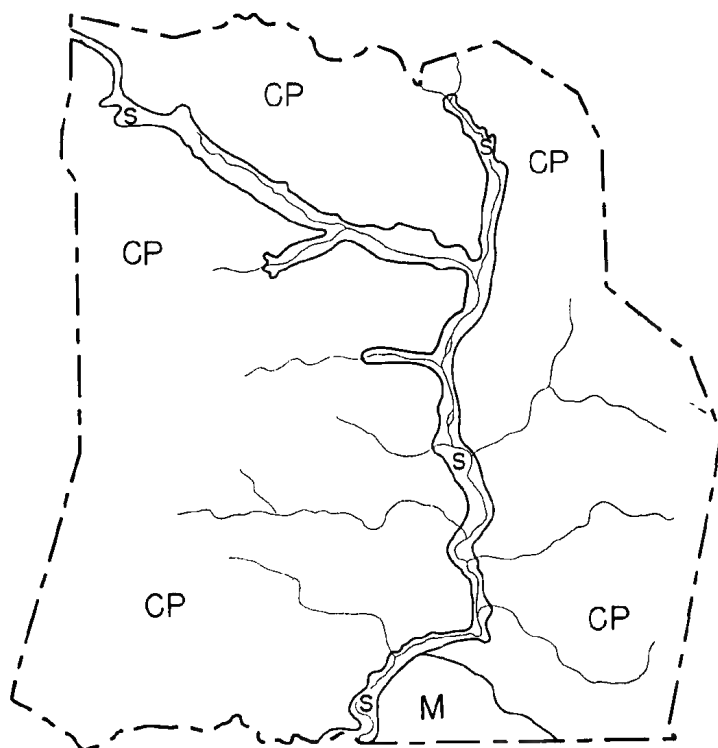


Figure 3.—General soil areas: CP, mineral soils of Coastal Plain; S, swamp; M, muck.

soils are subject to frequent overflows. They are potentially good for farming but require drainage. This area is forested with gum and cypress.

Muck (M).—Organic soils in Angola Bay and Kenan Pocosin. The drainage and cultivation of muck soils have not been successful. This soil area is forested with cypress, juniper, pond pine, and gum and has an understory of water-tolerant shrubs.

Soils Grouped According to Natural Drainage

All the soils of Duplin County except Pamlico muck are derived from the Coastal Plain formations. Pamlico muck is of organic origin.

The soil series of Duplin County are placed in five groups according to drainage. The drainage groups, physiographic position, geologic material, and texture of the subsoil are given for the soil series in table 4.

The county generally dips toward the south and south-east. As land elevations approach sea level, the soils are progressively less well drained. Most of the well-drained soils are in the northern, northwestern, and northeastern parts of the county, and the greater portion of the very poorly drained soils is in the southern and southeastern parts. Thus soils that have developed from similar parent material have different characteristics because of differences in relief and drainage.

A group of soils developed from the same kind of material but under different drainage is called a catena. An example of a catena, as shown in table 4, is the Kenansville catena. It consists of the following soils: The well-drained Kenansville, the moderately well drained Woods-

town, the somewhat poorly drained Dragston, the poorly drained Fallsington, and the very poorly drained Pocomoke.

Some soils in the county are underlain by a sandy substratum at depths ranging from 30 to 60 inches or more. This is especially true of the soils of the Kenansville catena. The soils of the Kenansville catena characteristically become sandier below depths of 30 to 40 inches and, in places, are underlain by sand or loamy sand at these depths. The sand substratum occurs consistently only under the Kenansville soils.

Description of the Soils

In this section the soils, identified by the symbols that are used on the soil map, are described in detail, and their land capability units are given. The approximate acreage and the proportionate extent of the soils are given in table 5, and their location and distribution are shown on the maps in the back of this report. Statements on plant-nutrient status, content of organic matter, and pH (acidity) are based on averages of analyses of topsoil samples from cultivated fields. They indicate the average conditions of cultivated topsoils (A horizons) of the various soils. High, medium, and low are indications of the nutrient level as measured by the Soil Testing Division, North Carolina Department of Agriculture.

BAYBORO SERIES

Soils of the Bayboro series have developed from clay and silty clay deposits of the Coastal Plain formations. They occur on the broad, flat interstream areas and usually occupy bays or slight depressions. The soils are level, or nearly so, and gradients rarely exceed 1 percent. The soils are very poorly drained. The Bayboro series is associated with the Portsmouth, Pocomoke, Bladen, and Lenoir series. The native vegetation is water tolerant and consists of gum, swamp maple, a few loblolly and pond pines, and an occasional cypress. Only one soil was mapped in this series in Duplin County.

Bayboro loam (0 to 2 percent slopes) (Ba).—This soil occurs on low uplands and occupies small areas throughout the county, mainly in the flatwoods. Very little of the soil has been cleared or drained for cultivation.

The following is a profile description of Bayboro loam in a pasture:

- 0 to 10 inches, black friable loam, high in organic matter.
- 10 to 18 inches, very dark brown friable loam.
- 18 to 26 inches, gray silty clay loam; firm when moist, plastic when wet.
- 26 to 36 inches, gray plastic silty clay, faintly mottled with yellowish brown.
- 36 to 40 inches+, dark-gray plastic silty clay.

The surface layer ranges from 6 to 20 inches in thickness. In local areas it contains enough organic matter to be almost a muck.

Bayboro loam is strongly acid, slowly permeable, and moderate in moisture-holding capacity. This soil is suitable for cultivation when drained. Draining is difficult because water moves slowly through the subsoil, and suitable outlets for drainage systems are not readily available. Ditches may have to cross the lands of other owners to reach an outlet in a natural waterway.

TABLE 4.—*Drainage, physiographic position, geologic material, and subsoil texture of the soil series and miscellaneous land types*

SOILS OF THE UPLANDS					
Geologic material and subsoil texture	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
Unconsolidated sands and clays of Coastal Plain formations:					
Sand subsoil.....	{ Eustis..... Galestown..... Lakeland..... }	{ Klej..... }	{ Klej..... Plummer..... }	{ Plummer..... }	Rutlege.
Sand subsoil with hardpan layer.....	.....	{ Ona ¹ Immokalee..... }	{ Ona ¹ Immokalee..... Leon..... Dragston..... }	{ Leon..... Fallsington..... }	St. Johns. Pocomoke.
Loam, sandy loam, and light sandy clay loam subsoil. ²	Kenansville.....	Woodstown.....	.....	.....	.....
Sandy loam to sandy clay loam subsoil.	{ Norfolk..... Ruston..... }	{ Goldsboro..... }	Lynchburg.....	Rains.....	Portsmouth.
Heavy sandy clay loam to sandy clay subsoil.	{ Magnolia..... Marlboro..... }	{ Duplin..... }	Dunbar.....	Coxville (sandy clay subsoil phase).	.....
Fine sandy clay, clay, or silty clay subsoil.	{ Caroline..... }	Craven.....	Lenoir.....	{ Coxville..... Bladen..... }	{ Bayboro..... }
Organic material.....	.....	.....	.....	.....	Pamlico muck.
SOILS OF THE STREAM TERRACES					
Old mixed alluvium from Coastal Plain formations:					
Sandy loam to light sandy clay loam subsoil.	{ Kalmia..... }	{ Kalmia..... Stough..... Izagora..... }	{ Stough..... Izagora..... }	Myatt.....	Okence.
Heavy sandy clay loam to sandy clay subsoil.	.....	.....	.....	.....	.....
Sand subsoil.....	Lakeland (terrace phase).	Klej (terrace phase).	{ Klej (terrace phase). Plummer (terrace phase). }	{ Plummer (terrace phase). }	.....
SOILS OF THE BOTTOM LANDS					
Recent alluvium from soils derived from Coastal Plain sands and clays.	.....	.....	.....	Mixed alluvial land, poorly drained.	{ Johnston. Swamp. }
SOILS OF THE COLLUVIAL LANDS					
Local colluvium and some alluvium from soils derived from Coastal Plain sands and clays.	.....	.....	Mixed local alluvial land.	.....	.....

¹ Weakly cemented pan.² The substrata of soils in this catena are in many places sandier

than the subsoils; textures may range from loam to loamy sand or sand.

The small cultivated acreage of this soil is usually within larger fields. When drained, this soil has good tilth and is well suited to corn, soybeans, and oats, but not to cotton or tobacco. It is in capability unit IVw-3.

BLADEN SERIES

Soils of the Bladen series have developed from silty clay or clay deposits of the Coastal Plain formations. They occur throughout the county but are more common in the northwestern and eastern parts. They are on flat uplands

in association with soils of the Bayboro, Coxville, Dunbar, Lynchburg; and Rains series. Slopes are usually less than 1 percent. The native vegetation is water tolerant and consists of swamp maple, gum, pond and loblolly pines, and bay and other shrubs.

Bladen silt loam (0 to 2 percent slopes) (Bc).—This poorly drained soil is in relatively small areas on broad interstream flats and in slight depressions. Its area in the county is small.

TABLE 5.—Approximate acreage and proportionate extent of soils

Soil	Area	Extent	Soil	Area	Extent
	<i>Acres</i>	<i>Percent</i>		<i>Acres</i>	<i>Percent</i>
Bayboro loam.....	768	0.1	Magnolia loamy fine sand:		
Bladen silt loam.....	1,838	.3	Nearly level thick surface phase.....	88	(¹)
Bladen fine sandy loam.....	2,235	.4	Gently sloping thick surface phase.....	210	(¹)
Caroline fine sandy loam:			Magnolia fine sandy loam:		
Gently sloping phase.....	958	.2	Eroded gently sloping phase.....	163	(¹)
Eroded gently sloping phase.....	1,221	.2	Eroded sloping phase.....	133	(¹)
Sloping phase.....	928	.2	Marlboro fine sandy loam:		
Eroded sloping phase.....	1,283	.2	Nearly level phase.....	923	0.2
Strongly sloping phase.....	1,047	.2	Gently sloping phase.....	284	.1
Caroline-Lakeland Complex:			Eroded gently sloping phase.....	544	.1
Gently sloping phases.....	411	.1	Mixed alluvial land, poorly drained.....	31,810	6.0
Sloping phases.....	722	.1	Mixed local alluvial land.....	5,283	1.0
Strongly sloping phases.....	126	(¹)	Myatt fine sandy loam.....	4,353	.8
Coxville fine sandy loam.....	883	.2	Myatt loamy fine sand.....	2,730	.5
Coxville fine sandy loam, sandy clay subsoil			Norfolk fine sandy loam:		
phase.....	11,972	2.3	Nearly level phase.....	16,360	3.1
Craven fine sandy loam:			Gently sloping phase.....	7,399	1.4
Nearly level phase.....	2,089	.4	Eroded gently sloping phase.....	3,205	.6
Gently sloping phase.....	1,188	.2	Sloping phase.....	226	(¹)
Eroded gently sloping phase.....	1,032	.2	Eroded sloping phase.....	342	.1
Eroded sloping phase.....	358	.1	Norfolk loamy fine sand:		
Dragston fine sandy loam.....	4,690	.9	Nearly level thick surface phase.....	12,265	2.3
Dragston loamy fine sand, thick surface phase.....	963	.2	Gently sloping thick surface phase.....	12,672	2.4
Dunbar fine sandy loam.....	7,963	1.5	Sloping thick surface phase.....	620	.1
Duplin fine sandy loam:			Okenee loam.....	2,338	.4
Nearly level phase.....	6,264	1.2	Okenee fine sandy loam.....	1,934	.4
Gently sloping phase.....	992	.2	Ona fine sand.....	2,041	.4
Eustis loamy fine sand:			Ona loamy fine sand.....	867	.2
Nearly level phase.....	296	.1	Pamlico muck.....	5,681	1.1
Gently sloping phase.....	1,670	.3	Pamlico muck, shallow phase.....	3,848	.7
Fallsington fine sandy loam.....	8,407	1.6	Plummer fine sand.....	7,226	1.4
Galvestown fine sand:			Plummer fine sand, terrace phase.....	812	.2
Nearly level phase.....	1,007	.2	Plummer loamy fine sand.....	5,272	1.0
Gently sloping phase.....	762	.1	Pocomoke loam.....	9,269	1.8
Goldsboro fine sandy loam:			Portsmouth loam.....	10,178	1.9
Nearly level phase.....	19,286	3.7	Portsmouth mucky loam.....	1,696	.3
Gently sloping phase.....	2,431	.5	Rains fine sandy loam.....	26,935	5.1
Goldsboro loamy fine sand:			Rains loamy fine sand, thick surface phase.....	3,033	.6
Nearly level thick surface phase.....	3,594	.7	Ruston fine sandy loam:		
Gently sloping thick surface phase.....	1,450	.3	Nearly level phase.....	783	.2
Immokalee fine sand.....	597	.1	Gently sloping phase.....	1,447	.3
Izagora fine sandy loam.....	432	.1	Eroded gently sloping phase.....	1,598	.3
Johnston loam.....	360	.7	Sloping phase.....	545	.1
Kalmia fine sandy loam.....	929	.2	Eroded sloping phase.....	1,058	.2
Kenansville fine sandy loam:			Eroded strongly sloping phase.....	658	.1
Nearly level phase.....	4,894	.9	Ruston loamy fine sand:		
Gently sloping phase.....	996	.2	Nearly level thick surface phase.....	405	.1
Kenansville loamy fine sand:			Gently sloping thick surface phase.....	1,848	.4
Nearly level thick surface phase.....	9,852	1.9	Sloping thick surface phase.....	644	.1
Gently sloping thick surface phase.....	2,478	.5	Strongly sloping thick surface phase.....	195	(¹)
Klej fine sand.....	8,430	1.6	Rutlege loam.....	240	(¹)
Klej fine sand, terrace phase.....	709	.1	Rutlege loam, thick surface phase.....	5,790	1.1
Klej loamy fine sand.....	18,093	3.4	Rutlege loamy fine sand.....	34,118	6.5
Lakeland fine sand:			Rutlege mucky loam, thick surface phase.....	1,359	.3
Nearly level phase.....	6,000	1.1	St. Johns loamy fine sand.....	5,075	1.0
Gently sloping phase.....	28,448	5.4	Stough fine sandy loam.....	2,998	.6
Sloping phase.....	2,118	.4	Stough loamy fine sand, thick surface phase.....	1,515	.3
Strongly sloping phase.....	684	.1	Swamp.....	30,024	5.7
Nearly level shallow phase.....	5,443	1.0	Woodstown fine sandy loam:		
Gently sloping shallow phase.....	11,087	2.1	Nearly level phase.....	8,535	1.6
Sloping shallow phase.....	651	.1	Gently sloping phase.....	465	.1
Terrace phase.....	1,443	.3	Woodstown loamy fine sand, nearly level		
Lakeland loamy fine sand:			thick surface phase.....	3,455	.7
Nearly level phase.....	780	.2	Mines and pits.....	230	(¹)
Gently sloping phase.....	476	.1	Water.....	1,019	.2
Lenoir fine sandy loam.....	2,938	.6			
Leon fine sand.....	19,242	3.7			
Lynchburg fine sandy loam.....	19,059	3.6			
Lynchburg loamy fine sand, thick surface					
phase.....	3,122	.6			
			Total.....	526,080	100.0

¹ Less than $\frac{1}{10}$ of 1 percent.

The following is a profile description of Bladen silt loam in a cultivated field:

- 0 to 12 inches, dark-gray silt loam.
- 12 to 22 inches, dark-gray silty clay, finely mottled with yellowish brown; plastic when wet, hard when dry.
- 22 to 28 inches, gray silty clay, finely mottled with yellowish brown; plastic when wet, hard when dry.
- 28 to 40 inches+, gray clay; medium mottlings of yellowish brown; plastic when wet, very hard when dry.

The surface layer ranges from 6 to 14 inches in thickness, and the subsoil varies from clay to heavy sandy clay loam.

This soil has medium natural fertility. It is strongly acid. The pH is usually 5.0 or less. In a few local areas, however, that are underlain by marl, the pH is about 6.5. These areas are (a) along Mill Swamp in the southeastern part of the county, (b) 4 miles southeast of Chinquapin, and (c) 3 miles east of Chinquapin near Lanier crossroads. Supplies of calcium and magnesium are low to medium, phosphorus is medium, and potassium is low in Bladen silt loam. The content of organic matter is about 2 percent. The subsoil is very slowly permeable. The moisture-holding capacity is moderate.

Bladen silt loam is suitable for cultivation only when it has been drained. When improved in this manner, it is best suited to corn, soybeans, and oats and is well suited to improved pasture. The soil is in capability unit IVw-3.

Bladen fine sandy loam (0 to 2 percent slopes) (Bb).—This soil has a coarser textured surface soil and less silt and more sand in the subsoil than Bladen silt loam. The subsoil is consequently more permeable and allows water to drain through it somewhat more easily.

This soil is suitable for the same crops as Bladen silt loam, and it has similar management requirements but is more easily managed because of the more permeable subsoil. It is in capability unit IIIw-2.

CAROLINE SERIES

Soils of the Caroline series have developed from fine sandy clay or clay of the Coastal Plain formations. They occupy gently sloping to strongly sloping areas along the breaks of streams and marine-terrace escarpments. Associated soils are of the Craven, Magnolia, Marlboro, Norfolk, Ruston, and Lakeland series. The Caroline soils are well drained. They are very erodible, even on gentle slopes. The native vegetation is chiefly hardwood trees, but there are a few shortleaf and loblolly pines.

Caroline fine sandy loam, gently sloping phase (2 to 5 percent slopes) (Ca).—This soil is associated with members of its own series, as well as with other soil series that are listed in the discussion of the Caroline series.

The following is a profile description of Caroline fine sandy loam in a forested area:

- ½ to 0 inch, leaf mold.
- 0 to 5 inches, dark-gray loamy fine sand.
- 5 to 12 inches, light brownish-gray loamy fine sand, slightly mottled with white.
- 12 to 31 inches, strong-brown fine sandy clay; fine red mottles begin to show at a depth of 14 inches and are prominent in the lower part; firm when moist, brittle and hard when dry.
- 31 to 42 inches+, mottled light yellowish-brown, light-gray, and red fine sandy clay; firm when moist, brittle and hard when dry.

The texture of surface soil is sandy loam or loamy sand, and the thickness ranges from about 8 to 18 inches.

Subsoil permeability is slow and runoff is rather rapid.

The soil is strongly acid (pH 5.2), and the content of organic matter is about 1 percent. This soil is medium in content of magnesium and calcium, high in phosphorus, and very low in potassium.

Although this soil is suitable for most crops grown in the county, it is somewhat droughty and is very erodible. For these reasons it is only fair for agriculture. The soil occurs as rather small areas in association with better soils, and consequently most of it has been cleared. Runoff should be controlled on cultivated areas to prevent soil erosion. This soil is in capability unit IIIe-2.

Caroline fine sandy loam, eroded gently sloping phase (2 to 5 percent slopes) (Cb).—This soil has lost from 25 to 75 percent of its original surface soil through erosion. The remaining surface soil has been mixed with the subsoil during tillage, and fields have a spotted appearance. The surface soil is now yellowish brown in spots that have lost the most soil, and gray and light brownish gray where the loss of soil has been least.

Because this soil is eroded, it has more runoff than the gently sloping phase of Caroline fine sandy loam. It tends to form a crusty surface, and a full stand of plants is therefore difficult to obtain. Management and crops are the same as for the gently sloping phase, but average yields are somewhat lower.

This is a minor soil in area and importance. It is in capability unit IIIe-2.

Caroline fine sandy loam, sloping phase (5 to 8 percent slopes) (Cc).—This soil differs from the gently sloping phase only in slopes. It is not an important agricultural soil, and it is in capability unit IIIe-2.

Caroline fine sandy loam, eroded sloping phase (5 to 8 percent slopes) (Cd).—This soil differs from the gently sloping phase of Caroline fine sandy loam in slope and in erosion damage. Over most of the area, 25 to 75 percent of the original surface soil has been lost, but in spots all the original surface soil and part of the subsoil are gone.

This soil is suited to the same crops and management practices as the uneroded Caroline soils, but generally its yields average less. It is of minor agricultural importance. It is in capability unit IIIe-2.

Caroline fine sandy loam, strongly sloping phase (8 to 12 percent slopes) (Ce).—In profile characteristics this soil is similar to the gently sloping phase of Caroline fine sandy loam, but some of the open areas have been damaged by erosion. Slopes are steeper; in places the upper slope range is greater than 12 percent.

This soil is suitable for only occasional cultivation because it is highly erodible, droughty, and steep. It should be covered permanently by vegetation, preferably by forest. It is also fairly good for pasture and can be used for it when adjacent soils are in pasture. This soil is mostly in forest. It is in capability unit IVe-1.

CAROLINE-LAKELAND COMPLEX

Where the Caroline and Lakeland series are intricately mixed, they are mapped together as a complex. The parent material of this complex is a mixture of sandy formations from which the Lakeland developed and sandy clay formations from which the Caroline developed.

This complex occurs on gently to strongly sloping relief. Internal drainage varies from slow to very rapid. Runoff is mostly slow to medium, but locally it may be rapid.

This complex occurs in association with the Craven, Norfolk, Magnolia, Lakeland, Caroline, Dunbar, and Duplin soils. It is of minor agricultural importance and is found mostly in small areas in the southwestern part of the county along Rockfish Creek. The forest cover is of the hardwood type, with some loblolly and shortleaf pines.

Caroline-Lakeland complex, gently sloping phases (2 to 5 percent slopes) (Cf).—The soil pattern that forms this complex is intricate and variable. Surface soil textures range from fine sand to fine sandy loam; there may be several changes in texture within a lateral distance of 100 feet. Depth to clay is highly variable. The range is from 12 to 42 inches in the Caroline up to 72 inches or more in the Lakeland. Permeability ranges from slow to rapid, the rate depending on whether or not there is a sandy clay layer in the subsoil. The reaction is strongly acid, and the organic-matter content is low.

This complex of soils is droughty but has good tilth. Only a little is in cultivation, and yields are low. Most forage crops do poorly. Such perennials as sericea lespedeza and Coastal bermudagrass grow satisfactorily. This mapping unit is in capability unit IIIs-1.

Caroline-Lakeland complex, sloping phases (5 to 8 percent slopes) (Cg).—This complex differs from the gently sloping Caroline-Lakeland complex only in having steeper slopes. Uses and management requirements are the same. This mapping unit is in capability unit IIIs-1.

Caroline-Lakeland complex, strongly sloping phases (8 to 12 percent slopes) (Ch).—This mapping unit differs from the gently sloping Caroline-Lakeland complex in slope. Slope gradients are occasionally steeper than 8 to 12 percent. The droughtiness of this complex, in combination with the adverse relief, makes it unsuited to cultivation. It is best used for forest, although it rates only fair to poor for that purpose. The capability unit classification for this mapping unit is VIIs-1.

COXVILLE SERIES

Soils of the Coxville series have developed from the sandy clay members of the Coastal Plain formations. They occupy nearly level interstream flats or slight depressions and are poorly drained. Coxville soils occur throughout the county, but they are most common in the northern and western parts. The series is associated with the Bladen, Craven, Dunbar, Duplin, Goldsboro, Lenoir, Lynchburg, Marlboro, Norfolk, Portsmouth, and Rains series. The native vegetation is water tolerant and consists of gum, swamp maple, pond and loblolly pines, bay bushes, and an occasional cypress.

Coxville fine sandy loam (0 to 2 percent slopes) (Ck).—The areas of this soil are small. Slopes rarely exceed 1 percent. Where this soil occurs in shallow depressions, it is associated with the well-drained soils of the Marlboro and Norfolk series. In nearly level uplands, it is more likely to be associated with the less well-drained soils of the Bladen, Lenoir, Craven, Dunbar, Duplin, Goldsboro, Lynchburg, and Rains series. Most of the soil has been cleared and drained because it occurs as small patches and is used along with the better drained soils.

A profile description of Coxville fine sandy loam in an open field is as follows:

- 0 to 6 inches, dark-gray fine sandy loam.
- 6 to 24 inches, grayish-brown fine sandy clay, faintly and finely mottled with dark grayish brown and brownish yellow; sticky and plastic when wet, very hard when dry.
- 24 to 36 inches+, grayish-brown fine sandy clay, mottled with gray and yellowish brown; red mottles are common in the lower part; very sticky and plastic when wet, very hard when dry.

The thickness of surface soil ranges from 4 to about 16 inches; the color varies from gray to almost black, depending on the content of organic matter. The texture of the subsoil is heavy sandy clay loam, sandy clay, or clay. In places red mottling occurs in the lower subsoil.

Runoff is very slow, except in undrained depressions, where the soil is ponded. This soil is strongly acid. Its moisture-holding capacity is moderate to good; tilth is favorable. The subsoil is slowly to very slowly permeable.

If the soil is drained, it is well suited to corn, oats, and soybeans, and to forage plants such as fescue and Ladino clover. Areas of this soil that are not in depressions and that have surface soil from 10 to 14 inches thick are excellent sites for loblolly pine trees. Coxville fine sandy loam is in capability unit IIw-2.

Coxville fine sandy loam, sandy clay subsoil phase (0 to 2 percent slopes) (Cm).—This soil has sandier subsoil than Coxville fine sandy loam and consequently is more permeable. The texture of the subsoil ranges from heavy fine sandy clay loam to light fine sandy clay.

This soil occurs in small patches on interstream flats and in bays throughout the county; its total acreage is small. It is associated with the fine sandy loam soils of the Dunbar, Duplin, Goldsboro, Lynchburg, and Rains series and with Portsmouth loam.

This soil is strongly acid; the average pH is about 5.4. The content of calcium and magnesium is medium, that of phosphorus is low, and that of potassium is very low. The content of organic matter is about 2 percent.

Most of this soil is wooded. When adequately drained, it is suitable for many of the crops commonly grown in the county. This soil is in capability unit IIw-3.

Craven Series

The Craven soils have been developed from the fine sandy clay or clay beds of the Coastal Plain formations. They occur as small areas on uplands throughout the county. Slopes range from nearly level to 12 percent or more. Craven soils are moderately well drained. Most of them have been cleared and cultivated, mainly because of their association with soils of greater agricultural importance. Craven soils are highly erodible, even on slopes that are of less than 2 percent gradient. The forest growth is mostly loblolly pine and hardwoods mixed with other species of pine.

Craven fine sandy loam, nearly level phase (0 to 2 percent slopes) (Cn).—This Craven soil occurs on flat uplands above the steeper slopes occupied by other Craven soils. It is associated with the Caroline, Lenoir, Norfolk, Lakeland, Marlboro, Duplin, and Dunbar soils and with other members of its own series.

A profile description of Craven fine sandy loam, nearly level phase, in an open field is as follows:

- 0 to 6 inches, grayish-brown fine sandy loam; slightly hard when dry, sticky when wet.
- 6 to 12 inches, pale-yellow fine sandy loam; friable when moist, sticky when wet.
- 12 to 24 inches, brownish-yellow fine sandy clay or fine sandy clay loam; hard when dry, slightly plastic when wet.
- 24 to 30 inches, brownish-yellow fine sandy clay or fine sandy clay loam; mottlings of gray and red are few and faint; hard when dry, plastic and sticky when wet.
- 30 to 40 inches+, brownish-yellow fine sandy clay, mottled with white and red; very hard when dry, plastic and sticky when wet.

Eroded spots are usually small and light gray or yellowish in color. Where slopes exceed 1 percent, erosion losses are common.

The soil is strongly acid; the average pH is about 5.2. It is medium in content of calcium and magnesium, high in phosphorus, and very low in potassium. The content of organic matter is about 1.5 percent. Permeability is slow in the subsoil; the moisture-holding capacity is moderate. Runoff is slow.

Much of this soil has been cleared and is in cultivation. The soil is suited to the crops commonly grown. The draining of excess water from flat areas is beneficial, particularly if the soil is used for tobacco. The soil is in capability unit IIw-1.

Craven fine sandy loam, gently sloping phase (2 to 5 percent slopes) (Co).—This soil differs from the nearly level phase in having steeper slopes. It is associated with soils of the Lakeland, Norfolk, Marlboro, Ruston, and Caroline series and with other soils of the Craven series. Runoff is medium, and local areas have lost up to 25 percent of the original surface soil. When the soil is cultivated, erosion control practices should be applied. The drainage of excess water is not needed for this soil.

A small part of this soil that occurs on short slopes within areas of better soils is cultivated. The soil is fairly good for crops and pasture; moderate to high yields can be expected if it is properly managed and conserved. It is in capability unit IIIe-2.

Craven fine sandy loam, eroded gently sloping phase (2 to 5 percent slopes) (Cp).—This soil differs from the nearly level phase in slope and in erosion. From 25 to 75 percent of the original surface layer has been lost through erosion. Runoff is medium to rapid, and in localized areas all of the surface soil and part of the subsoil are gone. Over most of the area, the subsoil has been mixed in tillage with the remaining shallow surface soil. The surface of the soil is now spotted and varies from light brownish gray to light yellowish brown. This soil is associated with the Caroline, Ruston, Norfolk, Marlboro, and Lakeland soils and with other members of its own series.

Most of this soil has been cleared and is in cultivation because it occurs on small, short slopes in association with better soils. It is moderately suitable for most crops grown in the county. The surface tends to crust, and good stands of plants are therefore somewhat difficult to obtain. Yields are somewhat lower than those obtained from the uneroded soils of the Craven series. This soil is good for pasture if well managed. It is in capability unit IIIe-2.

Craven fine sandy loam, eroded sloping phase (5 to 8 percent slopes) (Cr).—This soil differs from the nearly level phase of Craven fine sandy loam in slope and in

erosion. Runoff is rapid, and in most areas from 25 to 75 percent of the original surface soil has been lost. In the small areas where gradients are 8 to 12 percent, all of the original surface soil is ordinarily gone (fig. 4). The surface



Figure 4.—Erosion on Craven fine sandy loam, eroded sloping phase. The runoff from one rain has washed a gully about 2 feet wide the depth of the plow layer. A cover of vegetation would have protected the soil from this damage.

soil is now light brownish gray or light yellowish brown, depending on the damage from erosion. This soil is similar to the eroded gently sloping phase of Craven fine sandy loam in occurrence, distribution, and association.

This soil has about the same supply of plant nutrients as the nearly level phase. In addition, it is generally suited to the same crops, but yields are lower because of damage from erosion and droughtiness. It is fairly good for most row crops and for forage crops. It is slowly permeable, and cultivated areas need proper management. Most of the soil has been cleared and is in cultivation because it occurs as small patches on slopes that are surrounded by better soils. The soil is in capability unit IIIe-2.

DRAGSTON SERIES

Soils of the Dragston series have developed from beds of sands that grade into and are interbedded with light sandy clays of the Coastal Plain formations. These soils occur on uplands on the Wicomico terrace in the southern and eastern parts of the county. Slopes rarely exceed 1 percent. Dragston soils are associated with the Fallsington, Woodstown, Klej, Goldsboro, Lynchburg, Plummer, Portsmouth, and Rains series. The forest consists chiefly of gum, maple, and loblolly pine. Usually there is a fairly dense undergrowth of bay, huckleberry, myrtle, and other shrubs.

Dragston fine sandy loam (0 to 2 percent slopes) (Da).—This soil is somewhat poorly drained. Runoff is slow, and the water table is high. The soil is related to the Woodstown and Fallsington soils, and like them it is underlain by a layer of sand at a depth of about 40 inches.

A profile of Dragston fine sandy loam in a cultivated field is as follows:

- 0 to 10 inches, very dark grayish-brown loamy fine sand; considerable organic matter.
- 10 to 15 inches, gray to light-gray loamy fine sand.
- 15 to 20 inches, gray to light-gray fine sandy loam, mottled with olive yellow.
- 20 to 28 inches, brownish-yellow heavy fine sandy loam, prominently mottled with light gray; friable.
- 28 to 42 inches, mottled light-gray, pale-yellow, and white fine sandy loam; friable; may be stratified.
- 42 inches+, white sand.

The surface soil is darker in wooded areas. The texture of the subsoil ranges from light fine sandy loam to light fine sandy clay loam. The white sand layer, when present, may occur at various depths but is usually at depths between 40 and 60 inches. The substratum may range from sand to sandy loam.

The permeability of the subsoil is moderate to rapid, but it may vary with the texture. The soil is strongly acid (pH about 5.2). The content of organic matter is about 3 percent, and the moisture-holding capacity is moderately high. In localized areas, the soil contains a sandy substratum. Drainage ditches dug through this sandy substratum are not efficient because caving banks make maintenance difficult.

As a rule, the soil is suitable for cultivation only if the excess moisture is drained off. If drained adequately, it is suitable for most crops grown in the area and for pasture and meadow. About 40 percent of the acreage has been cleared and drained and is now in crops or pasture. The soil is in capability unit IIIw-1.

Dragston loamy fine sand, thick surface phase, (0 to 2 percent slopes) (Db).—This soil has a surface layer more than 18 inches thick. In this respect it differs from Dragston fine sandy loam, which has a surface soil that is usually less than 15 inches thick. These two soils have few or no other differences in profile characteristics. They have similar drainage and distribution. Dragston loamy fine sand has lower average yields, but suitable management practices and crops are the same for the two soils. Dragston loamy fine sand, thick surface phase, is in capability unit IIIw-1.

DUNBAR SERIES

The Dunbar soils have developed from sandy clay beds of the Coastal Plain formations. They occupy broad upland flats and have slopes ranging from 0 to about 2 percent. Dunbar soils occur in most parts of the county. They are common on the Sunderland terrace, where they occupy large areas and are of agricultural importance. They are somewhat poorly drained. Internal drainage is medium; runoff is slow because slopes are nearly level. Artificial drainage is necessary for the cultivation of this soil. About 60 percent of the acreage has been cleared.

Dunbar soils are associated with the Duplin, Lynchburg, Goldsboro, Rains, Craven, Lenoir, Bladen, and Coxville soils. Wooded areas have a mixture of loblolly pine, maple, gum, and oak. The underbrush is usually dense and consists of bay, huckleberry, myrtle, and other species. Only one soil was mapped in this series in Duplin County.

Dunbar fine sandy loam (0 to 2 percent slopes) (Dc).—This is the only Dunbar soil mapped in Duplin County.

An area of this soil in an open field has the following profile:

- 0 to 9 inches, dark-gray fine sandy loam; friable.
- 9 to 12 inches, gray very fine sandy loam, faintly mottled with yellow; friable.
- 12 to 30 inches, brownish-yellow clay loam, mottled with gray or strong brown; firm consistence and moderately developed coarse angular blocky structure.
- 30 to 42 inches +, brownish-yellow fine sandy clay loam; common coarse brown and gray mottles and a few fine red mottles.

The surface soil is much darker in forested areas. The texture of the subsoil ranges from fine sandy clay loam to clay loam.

Permeability is moderate to moderately slow in the subsoil, and drainage can be established satisfactorily by the use of open ditches or tile. The moisture-holding capacity is moderately high. The content of organic matter in cultivated fields ranges from 1 to 4 percent. The soil is medium in calcium and magnesium and low in phosphorus and potassium; the pH is about 5.1.

Dunbar fine sandy loam is one of the more extensive soils of the county. When drained, it is suitable for all crops commonly grown (fig. 5). The soil is preferred for strawberries, string beans, sweet corn, peppers, and squash. It is easily tilled, and most of the cleared area is in cultivated crops. Only a small acreage is in pasture, but the soil is well suited to hay and forage crops. Dunbar fine sandy loam is in capability unit IIw-2.



Figure 5.—Tobacco on the right is growing on Dunbar fine sandy loam and is free of disease; that on the left is growing on Marlboro fine sandy loam and has black shank disease.

DUPLIN SERIES

Soils of the Duplin series have developed from sandy clay beds of the Coastal Plain formations. They occupy the broad interstream uplands. Duplin soils are well-distributed over the county and are among the better and more extensive soils. Slopes range from 0 to 5 percent, but most Duplin soils have slopes of less than 2 percent. Soils of this series occur in close association with the related Marlboro and Dunbar soils; they are also associated with the Norfolk, Goldsboro, Craven, and Lenoir soils. The native vegetation consists mainly of loblolly pine mixed with oak, gum, and maple.

Duplin fine sandy loam, nearly level phase (0 to 2 percent slopes) (Dd).—This moderately well drained soil is one of the important agricultural soils in the county. Most of it is in the northern and southern parts of the county. It is most commonly associated with the nearly level phase of the Marlboro soil, with Dunbar fine sandy loam, and with the gently sloping phase of Duplin fine sandy loam. It is less commonly associated with the Norfolk, Goldsboro, Craven, and Lenoir soils. Internal drainage is medium to slow, and runoff is slow.

A profile description of this soil in an open field is as follows:

- 0 to 7 inches, light brownish-gray fine sandy loam; friable.
- 7 to 11 inches, pale-yellow fine sandy loam with a few faint, fine mottles of yellowish brown; friable.
- 11 to 19 inches, brownish-yellow fine sandy clay loam with a few faint, medium mottles of yellowish brown; friable.
- 19 to 34 inches, mottled yellowish-brown, strong-brown, and light yellowish-brown fine sandy clay loam; occasional gray mottles; firm when moist, hard when dry; moderate fine to medium coarse subangular blocky structure.
- 34 to 45 inches, prominently mottled strong-brown, yellowish-brown, red, light yellowish-brown, and gray firm fine sandy clay; moderate medium blocky structure.
- 45 inches +, strongly mottled yellowish-brown, pale-brown, or gray, firm very fine sandy clay with occasional streaks of red; massive; firm when moist and slightly plastic when wet.

The surface soil is darker in forested areas. It ranges from 6 to 14 inches in thickness, but it is 6 to 12 inches thick in 90 percent of the soil. The subsoil ranges from fine sandy clay loam to fine sandy clay.

Permeability is moderate to moderately slow in the subsoil, and the moisture-holding capacity is moderately high. This soil is strongly acid; the pH is about 5.3. It is medium in content of calcium, magnesium, and phosphorus and low in potassium. The organic-matter content ranges from about 0.5 percent to 5.0 percent. The soil is easily worked. It can be cultivated without artificial drainage. However, the removal of excess surface water from large flat fields is beneficial. Removal of surface water is also desirable for fields planted to tobacco.

This soil is suited to all crops grown in the county, and more than half its area has been cleared for cultivation. Crops are damaged only slightly in dry weather because soil moisture is favorable and slopes are gentle. Fertility can be improved and maintained rather easily. The chief crops are tobacco, corn, soybeans, and truck crops. This soil is in capability unit IIw-1.

Duplin fine sandy loam, gently sloping phase (2 to 5 percent slopes) (De).—This soil is moderately well drained. In local areas, slopes of 8 percent are included. Runoff is medium to rapid, and cultivated areas have been damaged by erosion.

The total acreage of this soil is small, but about half of it has been cleared for cultivation. It is one of the better

soils in the county and occurs in association with Duplin fine sandy loam, nearly level phase, and with soils of the Marlboro, Dunbar, Norfolk, and Goldsboro series. It is rarely associated with the Craven soils.

Soil reaction, available plant nutrients, content of organic matter, suitability for crops, and expected yields are about the same as for the nearly level phase of Duplin fine sandy loam. Because of stronger slopes and more runoff, the management of this soil should include prevention of erosion and conservation of moisture. This soil is in capability unit IIe-2.

EUSTIS SERIES

Soils of the Eustis series have developed from sand beds of the Coastal Plain formations. They occur throughout the county but are of minor extent. They are on or near the breaks of slopes along streams and along the escarpments of the Coharie and Sunderland marine terraces. Slopes are nearly level to gently sloping and have a maximum gradient of 5 percent. These soils are well drained to somewhat excessively drained. They are associated with the Norfolk, Ruston, and Lakeland soils. The original vegetation was mainly loblolly pine, but it contained some longleaf pine and oak. Eustis soils are of very little agricultural importance.

Eustis loamy fine sand, nearly level phase (0 to 2 percent slopes) (Ea).—This well-drained soil occurs mostly in the central part of the county. It is associated with soils of the Norfolk, Ruston, and Lakeland series, and with the gently sloping phase of Eustis loamy fine sand.

The following is a profile description of this soil in a cleared field:

- 0 to 8 inches, grayish-brown fine sand.
- 8 to 14 inches, brownish-yellow fine sand.
- 14 to 42 inches +, reddish-yellow fine sand; occasional balls of loamy fine sand.

The surface soil is darker in forested areas. This soil rarely contains a B horizon. However, where this horizon is present, it consists of fine sandy loam or fine sandy clay loam and occurs at depths of 36 to 42 inches.

Permeability is rapid, and the moisture-holding capacity is low. The soil is droughty, subject to wind erosion, and strongly acid. The average pH is 5.3. The content of plant nutrients and organic matter is low. This soil produces fair yields of high-quality tobacco. It is in capability unit IIIs-1.

Eustis loamy fine sand, gently sloping phase (2 to 5 percent slopes) (Eb).—This soil differs from the nearly level phase in slopes and in erosion. Runoff is greater, and the soil is somewhat more droughty than the nearly level phase. Runoff control and moisture-conservation practices are needed on cultivated areas. The soil is not suitable for agriculture. Its total area is small, and not more than 25 percent has been cleared. It will produce high-quality tobacco, but yields are rather low, except in years that are favorable for this crop. This soil is in capability unit IIIs-1.

FALLSINGTON SERIES

Soils of the Fallsington series have developed from interbedded sands and clays of the Coastal Plain formations. They occur mainly in the southeastern part of the county on the Wicomico and Chowan terraces. Slopes are nearly level. These soils are poorly drained, and the runoff is very slow or ponded. They are most commonly

associated with the related Dragston and Pocomoke soils, but they may also be associated with the Lynchburg, Plummer, Portsmouth, and Rains soils. The vegetation consists of gum, swamp maple, water oak, loblolly pine, and an occasional cypress. The underbrush consists of bay, myrtle, and blueberry. Only one soil was mapped in this series in Duplin County.

Fallsington fine sandy loam (0 to 2 percent slopes) (Fa).—This soil usually occupies slightly depressed, bay-like areas on broad upland flats.

The following is a profile description of Fallsington fine sandy loam in a cleared field:

- 0 to 8 inches, very dark gray, fine sandy loam; friable.
- 8 to 20 inches, dark-gray light fine sandy loam; friable.
- 20 to 40 inches, gray fine sandy loam; friable.
- 40 to 50 inches+, gray loamy fine sand grading into nearly white sand in lower part of horizon; friable.

The surface soil is darker in forested areas. The subsoil texture ranges from fine sandy loam to fine sandy clay loam. The texture of the substratum ranges from sand to sandy loam. The top boundary of the sand layer is undulating; within relatively short distances it may occur at depths ranging from about 30 to 50 inches or more.

The soil is strongly acid. Organic-matter and plant-nutrient content are about the same as in Rains fine sandy loam. The subsoil has moderate permeability and moderately high moisture-holding capacity.

This soil needs artificial drainage if cultivated or if used for improved pasture. Drainage is a problem where the sand layer is near the surface. Water saturates the sand, causing it to flow and clog drainage systems. If adequately drained, this soil is suitable for crops generally grown in the county. It responds to good management. Coastal bermudagrass, dallisgrass, lespedeza, and millet are fairly well suited to this soil. Corn, oats, and soybeans are the best suited field crops. Cotton and tobacco are not well suited.

Fallsington fine sandy loam has been partly cleared for agriculture, but it is mostly covered by forest. It is in capability unit IIIw-3.

GALESTOWN SERIES

Soils of the Galestown series have developed from sands of the Coastal Plain formations. They occupy the nearly level and gentle slopes on or adjacent to stream- and marine-terrace escarpments on the southern and southeastern parts of the Wicomico terrace. They are sandy and well drained and are not extensive. Galestown soils are associated with the Klej, Kenansville, Woodstown, Lakeland, Goldsboro, and Norfolk soils. The vegetation consists of a mixture of white, post, blackjack, and turkey oaks, loblolly pine, and an occasional shortleaf pine.

Galestown fine sand, nearly level phase (0 to 2 percent slopes) (Ga).—This soil is adjacent to stream- and marine-terrace escarpments. It is of little agricultural importance. Most of the soil, however, has been cleared and is in cultivation because it is surrounded by better soil.

The following is a profile description of Galestown fine sand, nearly level phase, in a wooded area:

- 0 to 10 inches, brown fine sand.
- 10 to 36 inches, brownish-yellow to yellowish-brown fine sand.
- 36 to 48 inches+, white fine sand; loose.

Thin bands of yellowish-brown fine sand may occur below the 30-inch depth. In some areas, the B horizon (the 10- to 36-inch layer) may be loamy sand.

Permeability of the soil is rapid. The water table is higher than in other well-drained soils of the county, and for this reason the soil is not so droughty. The content of organic matter and plant nutrients is low. This soil is strongly acid.

Row crops or forage crops are not very desirable for this soil. Coastal bermudagrass and sericea lespedeza are fairly suitable if the soil is well fertilized. The best use is for pine trees. This is not always a practical use because the soil occurs as small patches within areas of better soils. The soil is in capability unit IVs-1.

Galestown fine sand, gently sloping phase (2 to 5 percent slopes) (Gb).—This soil differs from Galestown fine sand, nearly level phase, only in slopes. The distribution, present use, recommended use, and importance to agriculture are the same for both soils. This soil is in capability unit IVs-1.

GOLDSBORO SERIES

Soils of the Goldsboro series have developed from sands and sandy clays of the Coastal Plain formations. They occupy uplands of the Wicomico and Sunderland terraces and occur mainly in the northern and central parts of the county. They are associated with soils of the Norfolk, Lynchburg, Marlboro, Dunbar, and Duplin series. Goldsboro soils are moderately well drained. Slopes range from 0 to 8 percent. The vegetation consists chiefly of loblolly pine and scattered blackjack and turkey oaks; the understory is of bay, huckleberry, and other shrubs. These soils cover a large area and are important to agriculture; more than half the acreage has been cleared.

Goldsboro fine sandy loam, nearly level phase (0 to 2 percent slopes) (Gc).—This soil is commonly associated with the nearly level phases of the related Norfolk and Lynchburg series; it occurs less often in association with Marlboro, Dunbar, and Duplin soils. It is fairly extensive and is suitable for crops commonly grown in the county.

The following is a profile description of Goldsboro fine sandy loam, nearly level phase, in a wooded area:

- ½ to 0 inch, organic material, disintegrated and partly decomposed.
- 0 to 6 inches, very dark gray fine sandy loam; friable.
- 6 to 12 inches, grayish-brown fine sandy loam; weak fine crumb structure; friable.
- 12 to 18 inches, light olive-brown fine sandy clay loam; weak fine subangular blocky structure; slightly sticky and plastic when wet; friable.
- 18 to 24 inches, light olive-brown light fine sandy clay loam, faintly mottled with yellowish brown; weak medium subangular blocky structure; firm.
- 24 to 46 inches, mottled yellowish-brown, light olive-brown, and gray fine sandy clay loam; weak medium subangular blocky structure; friable.
- 46 to 56 inches, mottled yellowish-brown, light olive-brown, and red fine sandy clay loam; friable.

The surface soil is lighter colored in cultivated areas. The thickness of the surface soil ranges from about 8 to 18 inches. The texture of the subsoil ranges from fine sandy loam to fine sandy clay loam. The mottled zone may begin near the top of the subsoil or at a lower depth.

Permeability of the subsoil is moderate. Runoff is slow because slopes are nearly level. The moisture-holding capacity is moderately high. The soil is strongly acid (pH about 5.2); the content of calcium and phosphorus is medium; that of magnesium and potassium is

low. The organic-matter content in open fields is about 2 percent.

Goldsboro fine sandy loam, nearly level phase, is one of the better soils of the county, and much of it has been cleared for cultivation. Ditches may be needed to drain excess surface water from larger areas or where the soil is used for tobacco. This soil is in capability unit IIw-1.

Goldsboro fine sandy loam, gently sloping phase (2 to 5 percent slopes) (Gd).—This soil differs from the nearly level phase of Goldsboro fine sandy loam in relief. Distribution and associated soils are about the same as for the nearly level phase. Included with this soil are small scattered areas having slopes up to 8 percent. Localized areas have lost up to 50 percent of the original surface soil through sheet erosion. On these eroded patches, the brownish subsoil has been mixed with the remaining gray surface soil in tillage. As a result, the surface has a spotted appearance.

Runoff is medium on this soil. The chief management problem is the control of erosion. This soil is suitable for all crops commonly grown in the county. It is a good agricultural soil and is in capability unit IIe-2.

Goldsboro loamy fine sand, nearly level thick surface phase (0 to 2 percent slopes) (Ge).—This soil differs from the Goldsboro fine sandy loam, nearly level phase, in thickness and texture of surface soil. The loamy fine sand surface soil is 18 to 30 inches thick. Distribution, associated soils, and suitability for crops are the same for the two soils. Average crop yields, however, are somewhat lower on this soil. Because of the greater thickness of the surface soil, this soil is more subject to leaching and is somewhat droughty. This soil is in capability unit IIs-1.

Goldsboro loamy fine sand, gently sloping thick surface phase (2 to 5 percent slopes) (Gf).—This soil is a little more rolling than the nearly level thick surface phase of Goldsboro loamy fine sand, but it is otherwise similar. The surface soil ranges from 18 to 30 inches in thickness. Because of the thickness of the surface soil, this soil is more subject to leaching and is somewhat droughty. Distribution and associated soils are the same as for the other Goldsboro soils. Small areas of this soil have slopes ranging up to 8 percent.

Most crops grown in the county are suitable to this soil, but yields average less than on other Goldsboro soils. This soil is of small extent and of minor importance to agriculture. It is in capability unit IIs-1.

IMMOKALEE SERIES

Soils of the Immokalee series have developed on sand beds of the Coastal Plain formations. They occur mainly in the eastern part of the county on low, flat uplands of the Wicomico terrace. The Klej, Lakeland, and Leon are associated soils. Immokalee soils are moderately well drained to somewhat poorly drained and have a strongly cemented hardpan in the subsoil. The vegetation is loblolly and longleaf pines, blackjack oak, and wiregrass. Only one soil was mapped in this series in Duplin County.

Immokalee fine sand (0 to 2 percent slopes) (Ia).—The following is a profile description of this soil in a forested area:

- 0 to 28 inches, white fine sand; very low in organic matter.
- 28 to 34 inches, dark-brown, strongly cemented fine sand (hardpan).
- 34 to 60 inches, dark-brown fine sand; very weakly cemented.

The surface layer ranges from 20 to 38 inches in thickness. The hardpan ranges from 1 to 10 inches in thickness and may be slightly or very firmly cemented. The brown layer under the hardpan ranges from 1 to 36 inches, or more, in thickness.

Immokalee fine sand is a poor soil and is not in cultivation in this county. Blueberries are grown successfully on it in other parts of the State. The best use is forest, but it is a poor site for trees. This soil is in capability unit IVw-2.

IZAGORA SERIES

Soils of the Izagora series have developed on old alluvial material that washed from Coastal Plain uplands. They occur on terraces along the major streams in the northern and southern parts of the county. Izagora soils are associated with those of the Kalmia, Stough, and Myatt series, and with terrace-phase soils of the Lakeland, Klej, and Plummer series. Slopes range from 0 to 5 percent, but they seldom exceed 2 percent. Izagora soils are moderately well drained, but in this county they include very small areas of somewhat poorly drained terrace soils that have rather heavy subsoils similar to those that underlie the moderately well drained soils. The small areas of soils with these two drainage conditions are intricately mixed, and their separation on the map is not feasible. The vegetation on the Izagora soils consists of loblolly pine, maple, gum, oak, holly, and myrtle. Only a few acres have been cleared, and the series is of very little agricultural importance. Only one soil was mapped in this series in Duplin County.

Izagora fine sandy loam (0 to 2 percent slopes) (Ib).—The following is a profile description of Izagora fine sandy loam:

- 0 to 6 inches, very dark gray fine sandy loam; friable.
- 6 to 20 inches, olive-brown fine sandy clay loam; weak medium subangular blocky structure; slightly sticky and slightly plastic when wet.
- 20 to 34 inches, dark grayish-brown firm fine sandy clay, mottled with light olive brown and dark yellowish brown; weak medium subangular blocky structure; slightly sticky and plastic when moist.
- 34 to 42 inches, mottled gray and dark yellowish-brown fine sandy clay; massive structure; slightly sticky and plastic when wet.
- 42 to 48 inches+, gray fine sandy loam; friable.

The surface soil ranges from 6 to 18 inches in thickness. The subsoil texture may be fine sandy clay loam or fine sandy clay.

Runoff is medium or slow, depending on whether the slopes are more than or less than 2 percent. The soil is strongly acid. The content of plant nutrients and organic matter is comparable to that of Dunbar fine sandy loam. The moisture-holding capacity is high, but artificial drainage is needed if the soil is cultivated or used for improved pasture. The permeability of the subsoil is moderately slow to slow.

All of this soil is now in forest. Where cleared and adequately drained in other parts of the State, the soil has been suitable for most row and forage crops commonly grown on the Coastal Plain. It will produce fair yields of tobacco, but the crop is not recommended for this soil. This soil is in capability unit IIw-2.

JOHNSTON SERIES

Soils of the Johnston series have developed on alluvial materials that washed from Coastal Plain uplands. They

occur on first bottoms along the major streams in the county in association with Swamp and Mixed alluvial land, poorly drained. Slopes are 1 percent or less. The soils are very poorly drained. They have a high water table and very slow runoff, and they are subject to frequent overflow. The vegetation consists of gum, swamp maple, occasional pond and loblolly pines, and water-tolerant underbrush. Only one soil was mapped in this series in Duplin County.

Johnston loam (0 to 2 percent slopes) (Ja).—The following is a profile description of Johnston loam:

- 0 to 18 inches, black loam, high in organic matter; friable.
- 18 to 26 inches, very dark gray fine sandy loam; friable.
- 26 to 30 inches, gray fine sandy clay loam; stratified.

The black surface soil is highly variable in thickness. The alluvial materials from which the soil has developed differ widely in texture and consistence. As a consequence, the soil varies.

Johnston loam is very strongly acid and has a high content of organic matter. None of this soil has been cleared. It is potentially a good agricultural soil. However, drainage is difficult because of low topographic position, high water table, and frequency of overflow. The cost of establishing adequate drainages is not justified. The soil is in capability unit IVw-1.

KALMIA SERIES

Soils of the Kalmia series have developed on old alluvial materials that washed from Coastal Plain uplands. They occur in the northern part of the county on the higher terraces along the larger streams that flow through the Coharie and Sunderland terraces. Slopes range from 0 to 5 percent, but the predominant slopes are from 0 to 2 percent. These soils are well drained to moderately well drained. Associated with the Kalmia soils are the other stream-terrace soils of the Stough, Myatt, and Izagora series and the terrace phases of the Klej, Lakeland, and Plummer series. The native vegetation consists mainly of loblolly pine and scattered shortleaf pine, mixed with dogwood, hickory, and oak. Only one soil was mapped in this series in Duplin County.

Kalmia fine sandy loam (0 to 2 percent slopes) (Ka).—This is one of the better soils, but it is not extensive. Much of it has been cleared.

The following is a profile description of Kalmia fine sandy loam in a pasture:

- 0 to 6 inches, dark grayish-brown loamy fine sand; very friable.
- 6 to 12 inches, light yellowish-brown loamy fine sand; very friable.
- 12 to 28 inches, yellowish-brown fine sandy clay loam; weak to moderate medium subangular blocky structure; friable.
- 28 to 44 inches+, light olive-brown fine sandy loam; weak fine subangular blocky structure; friable.

The surface soil is much darker in forested areas, and its thickness ranges from 6 to 18 inches. The subsoil texture ranges from fine sandy loam to fine sandy clay loam. Surface relief may be slightly hummocky.

Small areas having slopes of 2 to 5 percent are included with this soil, and some of these slopes have been slightly damaged through erosion. Also included are a few areas of Cahaba fine sandy loam that are too small to map separately. Cahaba soils have a friable, dark-brown fine sandy loam surface soil and a dark-brown fine sandy clay loam subsoil.

The subsoil permeability of Kalmia fine sandy loam is moderate, and moisture-holding capacity is moderately high. Acidity and content of plant nutrients and organic matter are about the same in Kalmia fine sandy loam as in the Norfolk fine sandy loam. Except for topographic position, the observable characteristics of these two soils are similar.

Much of this soil has been cleared for cultivation. It is an important soil in localities where most of the acreage occurs, and it is suitable for all crops commonly grown in the county. It is in capability unit I-1.

KENANSVILLE SERIES

Soils of the Kenansville series have developed from interbedded sand and sandy clay beds of the Coastal Plain formations. They occur on uplands throughout the county but are most common on the Wicomico terrace. They are associated with the Woodstown, Dragston, Norfolk, Goldsboro, Lakeland, Klej, and Ruston soils. The Kenansville series is the well-drained member of the Kenansville, Woodstown, Dragston, Fallsington catena. Slopes range from 0 to 5 percent. The native vegetation consists of loblolly and shortleaf pines, hickory, dogwood, and several species of oak. Kenansville soils are fairly extensive and important to agriculture.

Kenansville fine sandy loam, nearly level phase (0 to 2 percent slopes) (Kb).—This soil usually has rapid internal drainage, but runoff is slow to medium.

The following is a profile description of Kenansville fine sandy loam, nearly level phase, in an open field:

- 0 to 8 inches, grayish-yellow and light-gray loamy fine sand; very friable.
- 8 to 16 inches, pale-yellow loamy fine sand, mottled with yellowish brown; very friable.
- 16 to 22 inches, yellowish-brown heavy fine sandy loam, faintly mottled with strong brown; friable.
- 22 to 28 inches, brownish-yellow fine sandy loam; friable.
- 28 to 36 inches, brownish-yellow fine sandy loam; a few faint medium mottles of strong brown; very friable.
- 36 to 44 inches, yellow loamy fine sand, mottled medium pale yellow; loose.
- 44 to 56 inches, pale-yellow loamy fine sand; loose; grades into next lower layer.
- 56 to 64 inches+, white sand with thin streaks and mottles of pale yellow; loose.

The surface soil is darker in wooded areas. It ranges in thickness from 10 to 18 inches and in texture from loamy fine sand to fine sandy loam. The subsoil ranges from 6 to 30 inches in thickness. The sand substratum may occur between depths of 36 and 60 inches.

This soil is strongly acid; the pH averages about 5.4. Amounts of calcium and magnesium are low, phosphorus is high, potassium is very low. The content of organic matter is about 1.7 percent. This soil is slightly droughty because its surface soil is generally thick and its substratum is sandy. Subsoil permeability is moderate to rapid, and moisture-holding capacity is moderately low.

Much of this soil is in cultivation. It is suitable for crops commonly grown in the county; yields of most crops are about average. The yield of tobacco is high, and the quality is very good. This soil is in capability unit IIs-1.

Kenansville fine sandy loam, gently sloping phase (2 to 5 percent slopes) (Kc).—This soil differs from Kenansville fine sandy loam, nearly level phase, in relief. It is somewhat more droughty and has more rapid runoff

than the nearly level phase of Kenansville fine sandy loam. Acidity and content of organic matter and plant nutrients are about the same for both soils. Suitability for crops is also the same, though yields of some crops will average slightly less on this soil. Local areas have been damaged slightly by erosion. A high percentage of this soil is cultivated. It is in capability unit IIs-1.

Kenansville loamy fine sand, nearly level thick surface phase (0 to 2 percent slopes) (Kd).—This soil differs from the Kenansville fine sandy loam, nearly level phase, in having a coarser and thicker surface soil and a lower content of plant nutrients. The texture of the surface soil ranges from loamy fine sand to fine sand. In this soil, the surface layer is 18 to 30 inches thick, but it is less than 18 inches thick in Kenansville fine sandy loam, nearly level phase. The thicker surface layer makes this soil more droughty, and crop yields are less. Slopes, distribution, extent, and suitability for crops are about the same for the two soils. This soil is in capability unit IIIs-1.

Kenansville loamy fine sand, gently sloping thick surface phase (2 to 5 percent slopes) (Ke).—This soil differs from the Kenansville loamy fine sand, nearly level thick surface phase, only in relief. Although suitable for the crops commonly grown in the county, it is droughty and produces only fair yields. The area of this soil is small; about half has been cleared. This soil is in capability unit IIIs-1.

KLEJ SERIES

Soils of the Klej series, except the terrace phase, have developed from sandy beds of the Coastal Plain formations. The terrace phase has developed from sandy old alluvium on the stream terraces. Klej soils occur on marine-terrace uplands and on stream terraces along the larger streams. The soils are mainly on the Wicomico terrace and on stream terraces along the Northeast Cape Fear River. Associated soils are of the Galestown, Lakeland, Kenansville, and Woodstown series and the loamy fine sands of the Goldsboro, Plummer, and Norfolk series. Slopes are mostly within the range of 0 to 2 percent. Small areas with slopes up to 5 percent are also included. Klej soils are moderately well drained to somewhat poorly drained. The native vegetation consists of loblolly pine, white and post oaks, and dogwood. Klej soils are some of the most extensive in the county.

Klej fine sand (0 to 2 percent slopes) (Kf).—This soil is widely distributed throughout the county; most of it is on the Wicomico terrace. Runoff is slow because of the nearly level slopes and the rather high rate of infiltration. Internal drainage is rapid, except in some areas where it may be blocked by a high water table.

The following is a profile description of Klej fine sand in a wooded area:

- 0 to 8 inches, very dark gray fine sand; loose.
- 8 to 11 inches, light brownish-gray fine sand; loose.
- 11 to 17 inches, light yellowish-brown fine sand, mottled with light gray and yellowish red; loose.
- 17 to 26 inches, mottled light yellowish-brown and light brownish-gray fine sand; loose.
- 26 to 42 inches+, pale-yellow to white fine sand; loose.

The surface soil is lighter colored in cultivated fields than in wooded areas. The thickness of the surface layer varies from that given in the profile.

This soil includes areas that are somewhat poorly drained. In these areas, the mottling in the subsoil is nearer the surface and contains more gray. A few small areas having slopes up to 5 percent are also included in this mapping unit.

This soil is rapidly permeable and subject to leaching. The fairly high water table reduces the drought hazard in dry seasons. The soil is strongly acid; the pH is about 5.4. It is medium in content of calcium, low in magnesium, high in phosphorus, and very low in potassium. The content of organic matter averages about 2.2 percent.

Much of this soil is in cultivation, but yields are generally low. The soil is fair for tobacco, cotton, corn, and soybeans. It is poor for small grain, clover, and truck crops. Yields can be improved by good management and by heavy fertilization. This soil is in capability unit IVw-2.

Klej fine sand, terrace phase (0 to 2 percent slopes) (Kg).—This soil differs from Klej fine sand only in topographic position and in parent material. It is on stream terraces that are subject to infrequent overflows, whereas, the Klej fine sand is on uplands. There are no apparent differences in the profiles of these soils, in their uses, or in their suitability for crops. This soil is associated with the Izagora soils and the terrace phases of the Lakeland and Plummer series. It is very minor in extent and is in capability unit IVw-2.

Klej loamy fine sand (0 to 2 percent slopes) (Kh).—This soil differs from Klej fine sand in texture of surface soil. In addition, the subsoil is loamy fine sand rather than fine sand, and mottling is more pronounced than in the Klej fine sand subsoil.

Most of Klej loamy fine sand is somewhat poorly drained. At depths of about 60 inches, this soil is underlain by a heavy layer that raises the water table to a higher elevation than in Klej fine sand. If the soil is cultivated, excess surface water should be removed. Properly drained, this soil is suitable for crops commonly grown in the county. It is not extensive, and most of it is still in forest. It is in capability unit IIIw-3.

LAKELAND SERIES

Soils of the Lakeland series have developed mainly from sandy beds of the Coastal Plain formations. They are among the more extensive soils and are widely distributed throughout the county. Associated soils are the Klej, Kenansville, Norfolk, Craven, Caroline, Ruston, Goldsboro, and Eustis.

Lakeland soils have slopes ranging from 0 to 12 percent, but small areas on escarpments have stronger slopes. The native vegetation is longleaf and loblolly pines, blackjack and turkey oaks, and wiregrass. These soils are important in extent and in the agriculture of the county. About half the acreage is in cultivation.

Lakeland fine sand, nearly level phase (0 to 2 percent slopes) (La).—This well-drained soil is associated with the other members of the Lakeland series and with the nearly level phases of the Norfolk, Klej, Kenansville, Goldsboro, and Eustis series. It is rarely associated with the Craven and Caroline soils. Surface runoff is slow and internal drainage is rapid. In extent, it is one of the major soils of the county. More than half its acreage has been cleared and is in cultivation.

The following is a profile description of Lakeland fine sand, nearly level phase, in a wooded area:

- 0 to 4 inches, very dark gray fine sand; loose.
- 4 to 8 inches, grayish-brown fine sand; loose.
- 8 to 34 inches, pale-yellow fine sand; loose.
- 34 to 44 inches, light yellowish-brown fine sand, mottled with light brownish gray; loose.

The color of the surface soil is usually lighter in cultivated areas and darker in forested areas because of differences in content of organic matter. An exception is an area under longleaf and loblolly pines north of Cabin. Here, the surface soil is white to depths of 3 or 4 inches.

The subsoil permeability is rapid. This soil has low moisture-holding capacity. It is strongly acid; the pH is about 5.2. The content of calcium, magnesium, and potassium is very low; that of phosphorus is medium. The organic-matter content is about 1.0 percent. This soil is not subject to water erosion, but it is subject to wind erosion (fig. 6). Wind removes soil and exposes



Figure 6.—Lakeland fine sand blown into a wooded area from an adjacent cultivated field.

seeds in one part of a field and covers them too deeply in another part. Young plants are often damaged by moving soil particles.

The soil is only of fair quality, but a large part is in cultivation. It is very droughty because of the sandy profile and the low moisture-holding capacity. The nearly level slopes retard runoff and tend to minimize the drought hazard to some extent. Cotton, corn, sweet-potatoes, soybeans, and tobacco are the crops commonly grown. Yields are low and can be improved only slightly by the use of fertilizers and good management. The soil is in capability unit IVs-1.

Lakeland fine sand, gently sloping phase (2 to 5 percent slopes) (Lb).—This soil differs from the Lakeland fine sand, nearly level phase, only in slope. Associated soils are the Klej, Kenansville, Norfolk, Ruston, Goldsboro, and Eustis. Craven and Caroline soils are rarely associated with this soil. It is fairly extensive and much of it is in cultivation. It is in capability unit IVs-1.

Lakeland fine sand, sloping phase (5 to 8 percent slopes) (Lc).—This soil differs in slopes from the Lakeland fine sand, nearly level phase. It has a little more runoff, and some areas have been damaged slightly by erosion. The soil is somewhat more droughty than the nearly level phase. Wind erosion is also a hazard. This soil is associated with the more rolling areas of the Ruston, Norfolk, and Caroline soils and with other members of the Lakeland series. It has about the same general distribution as the nearly level phase, but it is not so extensive. A small percentage is in cultivation. The soil is in capability unit IVs-1.

Lakeland fine sand, strongly sloping phase (8 to 12 percent slopes) (Ld).—Most of this soil is on narrow ridges and escarpments. The total area is small, and the soil is not suitable for cultivation. Its best use is for pine trees. It is in capability unit VIIs-1.

Lakeland fine sand, nearly level shallow phase (0 to 2 percent slopes) (Le).—This soil has developed from sandy beds of the Coastal Plain formations that contain more fine-textured material than those from which the normal phases of Lakeland fine sand have developed. These beds are sands interstratified with thin laminae of sandy clay and are very much like the parent materials of the Kenansville and Woodstown soils.

This soil differs from Lakeland fine sand, nearly level phase, in having a layer of fine sandy loam or of light fine sandy clay loam in the lower subsoil. This layer occurs at depths ranging from 30 to 42 inches, and it usually extends to the parent material. In places it is underlain by loamy fine sand or fine sand. In these places, its thickness is variable but is never less than 6 inches. The presence of this fine sandy loam or light fine sandy clay loam improves the capacity of the soil to hold moisture. Consequently this soil is less droughty than the nearly level phase of Lakeland fine sand and yields of crops are higher. In general distribution and in association with other soils these two soils are the same.

The permeability of this soil is moderately rapid to rapid, and the moisture-holding capacity is low. The soil is strongly acid; the content of organic matter and plant nutrients is low. Erosion hazards are the same as on other Lakeland sands. Much of this soil has been cleared for cultivation. It is in capability units IIIs-1.

Lakeland fine sand, gently sloping shallow phase (2 to 5 percent slopes) (Lf).—This soil differs from Lakeland fine sand, nearly level shallow phase, in having more rolling relief. It is also slightly more droughty. Parent materials are similar to those from which Lakeland fine sand, nearly level shallow phase, has developed. Water erosion has slightly damaged the soil in some areas. Wind erosion is a hazard in spring and early in summer. The wind removes soil and exposes seeds in one part of the field and covers them too deeply in another part. Young plants are often damaged by moving particles of soil.

The soil is fairly extensive, and much of it has been cleared. Its general distribution over the county and the associated soils are the same as for Lakeland fine sand, gently sloping phase. The soil is in capability unit IIIs-1.

Lakeland fine sand, sloping shallow phase (5 to 8 percent slopes) (Lg).—In many places this soil occupies escarpments. It differs from the Lakeland fine sand, nearly level phase, in slope and in having in the lower subsoil the layer of fine sandy loam or light fine sandy clay loam typical of the shallow phases of Lakeland soils.

Slopes of this soil are steeper than those of the other shallow phases of Lakeland fine sand. Consequently this soil has greater runoff and is somewhat more droughty. Parent materials are similar to those from which Lakeland fine sand, nearly level shallow phase, has developed.

Localized areas have been damaged by water erosion and have lost 25 to 50 percent of their original surface soil. The wind-erosion problems of this soil are similar to those of other sandy soils. Associated soils are the more rolling areas of the Caroline, Norfolk, and Ruston soils, and the other Lakeland soils. This soil has the same general distribution as Lakeland fine sand, nearly level phase, but is less extensive; crop suitabilities are the same. The total area of this soil is small, but much of it has been cleared. Lakeland fine sand, sloping shallow phase, is in capability unit IVs-1.

Lakeland fine sand, terrace phase (0 to 2 percent slopes) (Lh).—This soil has developed from old sandy stream alluvium, and it occupies low stream terraces along the larger streams. It differs from Lakeland fine sand, nearly level phase, in parent material and topographic position. There are no apparent differences between the profiles of the nearly level phase and this terrace phase of Lakeland fine sand. The relief is dominantly nearly level, but small areas are included that have slopes up to 5 percent. Associated soils are of the Stough, Izagora, and Kalmia; the terrace phase of Klej fine sand; and the adjacent upland soils of the Lakeland series.

The soil is strongly acid and is low in content of plant nutrients and organic matter. It is rapidly permeable, droughty, and subject to occasional overflow. The total area is small, and nearly all the soil is in forest. This is a poor agricultural soil. It is in capability unit IVs-1.

Lakeland loamy fine sand, nearly level phase (0 to 2 percent slopes) (Lk).—This well-drained soil has developed from loamy sand beds of the Coastal Plain formations. It differs from Lakeland fine sand, nearly level phase, in having finer textured material in the profile. The upper part of the surface soil is gray loamy fine sand in wooded areas, and light brownish-gray loamy fine sand in cultivated areas. The lower part of the surface soil is light yellowish-brown loamy fine sand. The subsoil is a pale-yellow loamy fine sand grading into a pale-yellow and yellowish-brown light fine sandy loam at depths of 36 to 42 inches.

This soil is somewhat droughty but less so than Lakeland fine sand. Runoff is slow, and the subsoil permeability is moderately rapid. Distribution and associated soils are the same as for the nearly level phase of Lakeland fine sand. The soil is fairly extensive, and a large percentage is in cultivation. Cotton, corn, soybeans, and tobacco are crops most commonly grown. Crop yields average higher than those from the nearly level phase of Lakeland fine sand, and they are about the same as those of the shallow phases of Lakeland fine sand. This soil is in capability unit IIIs-1.

Lakeland loamy fine sand, gently sloping phase (2 to 5 percent slopes) (Lm).—This soil differs from the nearly level phase of Lakeland loamy fine sand in slope. Water erosion has slightly damaged the soil, and localized areas have lost up to 25 percent of their original surface soil. All cultivation should be along the contour. The soil has the same distribution and associated soils as the nearly level phase of Lakeland fine sand. A high percentage of the soil has been cleared for cultivation.

Droughtiness and a low supply of plant nutrients limit the usefulness of this soil. It is in capability unit IIIs-1.

LENOIR SERIES

Soils of the Lenoir series have developed from clay beds of the Coastal Plain formations. They are soils of uplands and occupy small areas over most of the county, but they are chiefly in the southeastern part. Associated soils are of the Bayboro, Bladen, Coxville, and Craven series. The Dunbar and Duplin series are less commonly associated with soils of this series. Slopes are from 0 to 5 percent but are mostly within the range of 0 to 2 percent. The soils are somewhat poorly drained. Internal drainage is slow; and runoff is slow to medium, depending on the percent of slope. Forests consist of white and post oaks, gum, hickory, and loblolly pine. Only one soil was mapped in this series in Duplin County.

Lenoir fine sandy loam (0 to 2 percent slopes) (Ln).—This soil is not extensive, and it is not an important agricultural soil. About 40 percent of it has been cleared.

The following is a description of a profile of Lenoir fine sandy loam in a cleared field:

- 0 to 8 inches, dark-gray fine sandy loam; friable.
- 8 to 12 inches, light olive-brown fine sandy loam, mottled with grayish brown and yellowish brown; medium subangular blocky structure; firm.
- 12 to 30 inches, grayish-brown fine sandy clay, mottled with yellowish brown and red; moderate angular blocky structure; hard when dry, sticky and plastic when wet.
- 30 to 42 inches, mottled gray, yellowish-brown, and red fine sandy clay; moderate medium blocky structure; hard when dry, plastic and sticky when wet.
- 42 inches +, mottled gray, very dark gray, yellowish brown, and red clay; massive; hard when dry, sticky and plastic when wet.

The surface soil is much darker in wooded areas. Red mottlings in the subsoil may be very few or absent. Layers of sand or loamy sand, mostly less than 6 inches thick, are sometimes present in the subsoil.

The subsoil is slowly permeable. This soil has moderately high moisture-holding capacity. It is strongly acid and highly erodible. Slopes of 1 or 2 percent have lost 25 to 50 percent of their original surface soil. Slopes of 2 to 5 percent have lost as much as 75 percent of the original surface soil. Fields are spotted because the surface of eroded areas is yellowish gray and that on the surrounding uneroded lands is gray.

This soil should be drained if cultivated or if used for improved pasture. If drained adequately, it is suitable for a few crops. Yields are better than average. This soil is in capability unit IIIw-2.

LEON SERIES

Soils of the Leon series have developed in uplands on sandy beds of Coastal Plain formations. Most of them are in the eastern part of the county on the Wicomico terrace, but small areas occur throughout the county. Associated soils are of the Klej, Plummer, and Rutlege series. The related hardpan soils of the Immokalee and St. Johns series also occur in association with the Leon soils. Slopes usually range from 0 to 2 percent, but in small areas the upper range is about 5 percent. Leon soils are poorly drained to somewhat poorly drained and have a strongly cemented hardpan in the subsoil. Internal drainage is slow; runoff is slow to medium, depending on the percent of slope. The native vegetation is longleaf and loblolly pines, scrub oak, wiregrass, and gallberry.

Soils of this series are of little agricultural importance, and only a small part has been cleared. Only one soil was mapped in this series in Duplin County.

Leon fine sand (0 to 2 percent slopes) (Lo).—This is a poor agricultural soil. The following is a profile description of Leon fine sand in a wooded area:

- 0 to 6 inches, gray fine sand has a salt-and-pepper appearance; loose.
- 6 to 12 inches, light-gray fine sand; loose.
- 12 to 16 inches, very dark grayish brown fine sand; weakly to strongly cemented; massive and brittle.
- 16 to 20 inches, dark grayish-brown fine sand; cemented but may be crushed with the hand.
- 20 to 40 inches, mottled yellow, light yellowish-brown, and yellowish-brown fine sand; loose.

The surface soil ranges from 6 to 24 inches in thickness. The pan is usually strongly cemented and hard, but it may be firm and crushable under hand pressure (fig. 7).



Figure 7.—Profile of Leon fine sand.

It is slowly permeable. The pan may occur as several hard layers that are separated by a lighter brown soft, sandy material.

The soil is strongly acid; the pH is 5.3. It is high in calcium, medium in magnesium and phosphorus, and very low in potassium. The organic-matter content is about 3.2 percent. Very little of this soil is cultivated. It is in capability unit IVw-2.

LYNCHBURG SERIES

Soils of the Lynchburg series have developed from sands and sandy clays of the Coastal Plain formations. They are upland soils and occur throughout the county. Lynchburg soils are associated with the related Goldsboro and Rains soils, the Dunbar, Portsmouth, Klej, and Plummer soils, and with the sandy clay subsoil phase of the Coxville series. Slopes range from 0 to 5 percent, but most of them are within the range of 0 to 2 percent. Natural drainage is somewhat poor; runoff and internal drainage are slow to very slow. The native vegetation is loblolly and longleaf pines, gum, white and turkey oaks, gallberry, myrtle, and other plants.

Lynchburg fine sandy loam (0 to 2 percent slopes) (Lp).—This somewhat poorly drained soil occurs over most of the county. A fairly large acreage of it is in cultivation. It is an important agricultural soil, though it needs artificial drainage. In localized places, the soil has been slightly damaged through erosion.

The following is a profile description of Lynchburg fine sandy loam in a wooded area:

- 0 to 6 inches, very dark gray fine sandy loam; friable.
- 6 to 14 inches, pale-olive and light brownish-gray fine sandy loam; friable.
- 14 to 30 inches, light brownish-gray fine sandy clay loam, mottled with brownish yellow and dark yellowish brown; weak medium subangular blocky structure; slightly plastic when wet; firm.
- 30 to 54 inches, light-gray fine sandy clay loam, mottled with pale yellow and dark yellowish brown; weak angular blocky structure; slightly plastic when wet.

The surface is lighter colored in cultivated fields because the content of organic matter is less. The thickness of surface soil ranges from 6 to 18 inches. The subsoil ranges from fine sandy loam to fine sandy clay loam. The degree and contrast of mottlings may differ from place to place.

The subsoil is moderately permeable. This soil has moderately high moisture-holding capacity. It is acid; the pH is about 5.2. The supply of calcium is high; of magnesium and phosphorus, medium; and of potassium, low. The soil contains about 3.2 percent of organic matter.

If adequately drained, Lynchburg fine sandy loam is suitable for a wide variety of crops. Most commonly grown are corn, cotton, soybeans, small grains, tobacco, and forage crops. Yields are average or slightly better. The soil is in capability unit IIw-2.

Lynchburg loamy fine sand, thick surface phase (0 to 2 percent slopes) (Lr).—This soil differs from Lynchburg fine sandy loam in having a thicker and a coarser textured surface soil. The surface soil thickness ranges from 18 to 30 inches, as compared with a range of 8 to 18 inches in the Lynchburg fine sandy loam. Because of its thicker and coarser surface soil, this soil loses more plant nutrients by leaching than Lynchburg fine sandy loam. This type of surface soil tends to reduce the amount of runoff, but it makes the soil, when drained, slightly more droughty. Drainage is required if the soil is cultivated. Crops suited to the soil are about the same as for the fine sandy loam; average yields are less. This soil is not extensive in the county. It is in capability unit IIIw-1.

MAGNOLIA SERIES

Soils of the Magnolia series have formed from sandy clay beds of the Coastal Plain formations. They are soils

of uplands and occur mainly in the northern part of the county. Associated soils are of the Marlboro, Norfolk, Ruston, and Caroline series. Slopes range from 0 to 8 percent, but in small local areas they may be as much as 12 percent. The soils are well drained and are some of the better soils in the county. Forests consist chiefly of oaks, but there are a few loblolly and shortleaf pines, hickory, and dogwood. Most of the soils have been cleared for cultivation, but they are highly erodible. Much of the area, including the gentle slopes, has been damaged by erosion.

Magnolia loamy fine sand, nearly level thick surface phase (0 to 2 percent slopes) (Mc).—This soil is minor in extent. However, it is agriculturally important because it is one of the better soils in the county and is nearly all in cultivation. It is associated with the nearly level phases of the Marlboro, Norfolk, Ruston, and Caroline series and with the other soils of the Magnolia series. The soil is well drained. Runoff is medium to slow. Internal drainage is medium.

The following is a profile description of this soil in a cultivated field:

- 0 to 8 inches, pale-brown loamy fine sand; friable.
- 8 to 10 inches, brownish-yellow loamy fine sand, streaked with red; weak coarse platy structure; friable.
- 10 to 15 inches, yellowish-red light fine sandy clay loam; weak medium subangular blocky structure; friable.
- 15 to 26 inches, red fine sandy clay loam; medium subangular blocky structure; firm when dry, slightly plastic and sticky when wet.
- 26 to 52 inches +, red clay loam; weak coarse subangular blocky structure; firm when moist, plastic and sticky when wet.

The only variation of importance is in the thickness of surface soil, which ranges from 14 to 30 inches. The thickness of the upper part of the surface soil is nearly constant. Most of the variation in surface soil thickness is in the lower part of the surface soil. The subsoil is fairly uniform, but there are very slight variations of color and texture. Slight erosion losses have occurred at the lower end of long slopes and in local areas where the slopes approach a gradient of 2 percent.

Subsoil permeability is moderately slow, and the moisture-holding capacity is moderately low. The soil is strongly acid; the pH is about 5.4. Calcium, magnesium, and potassium are low, phosphorus is medium, and the content of organic matter in the plow layer is about 1.5 percent.

This soil is easily improved and can be maintained at a high level of fertility. It is nearly all in cultivation, and it is suitable for all crops grown in the county. Under ordinary management yields are above average. This soil is in capability unit IIs-1.

Magnolia loamy fine sand, gently sloping thick surface phase (2 to 5 percent slopes) (Md).—This soil differs from the nearly level thick surface phase of Magnolia loamy fine sand in slope. Slopes are mainly gentle, but on small included areas, they are as much as 12 percent. Erosion has damaged this soil, and some areas have lost about half of the original surface soil. When the soil is in cultivation, control of runoff and conservation of moisture should be practiced. All of this soil has been cleared for cultivation. Yields and the quality of crops are good. The soil responds to good management; it is in capability unit IIs-1.

Magnolia fine sandy loam, eroded gently sloping phase (2 to 5 percent slopes) (Ma).—This well-drained soil differs from the thick surface phases of Magnolia loamy fine sand in having a thinner and a finer textured surface soil. Furthermore, it has been damaged by erosion. Much of the cultivated area has lost from 25 to 75 percent of its original surface soil. The remaining surface soil has been mixed in tillage with the red subsoil, and the plow layer is now a reddish color. The surface is spotted because the soil is red where erosion losses were greatest and less red where soil losses were least. The mixing of the heavier subsoil with the remaining surface soil causes a crusting that makes good stands of crops hard to obtain. The reduced permeability of the surface also increases the runoff and the risk of erosion. All the soil has been cleared, and most of it is now used for the crops commonly grown in the county. Yields are generally lower than from the thick surface phases of Magnolia loamy fine sand. This soil is in capability unit IIe-1.

Magnolia fine sandy loam, eroded sloping phase (5 to 8 percent slopes) (Mb).—This soil differs from the eroded gently sloping phase of Magnolia fine sandy loam in having stronger slopes. It is also somewhat more eroded. Most of the area has lost from 25 to 75 percent of the original surface soil. In some spots all of the surface soil has been lost. The red subsoil has been mixed with the remaining surface soil in tillage. The plow layer is now red or reddish, and its texture is a heavy fine sandy loam or a fine sandy clay loam. Color and texture depend upon the amount of subsoil in the plow layer.

Slopes and the damage from erosion accelerate the runoff and increase the risk of additional erosion. The surface tends to crust, and the soil is droughty. In spite of these hazards and limitations, this is a good soil. If properly managed and conserved, it will produce average or better yields of most crops commonly grown in Duplin County. It is in capability unit IIIe-1.

MARLBORO SERIES

Soils of the Marlboro series have developed in uplands on sandy clay beds of the Coastal Plain formations. They are mostly on the Sunderland and Wicomico terraces in the northern and western parts of the county. Associated soils are of the Magnolia, Norfolk, Ruston, and Duplin series. Slopes are dominantly in the range of 0 to 5 percent; small areas with slopes of 8 percent are included with this soil. The forests consist chiefly of oak, hickory, sweetgum, loblolly pine, and longleaf pine. All the Marlboro soils have been cleared for cultivation. They are not extensive but are some of the best soils in the county.

Marlboro fine sandy loam, nearly level phase (0 to 2 percent slopes) (Me).—This well-drained soil is usually associated with the nearly level phases of the Magnolia, Norfolk, Ruston, and Duplin series. Runoff is slow to medium, and internal drainage is medium.

The following is a profile description of this soil in a cultivated field:

- 0 to 5 inches, dark grayish-brown fine sandy loam; friable.
- 5 to 18 inches, dark-brown fine sandy clay loam; weak medium subangular blocky structure; friable.
- 18 to 32 inches, strong-brown fine sandy clay loam, mottled with yellowish red; moderate medium subangular blocky structure; firm when moist, hard and brittle when dry.

32 to 48 inches, strong-brown fine sandy clay loam, mottled with yellowish red; massive structure; friable when moist, hard and brittle when dry.

48 to 56 inches+, strong-brown fine sandy clay, mottled with yellowish red; firm when moist, hard and brittle when dry.

The thickness of the surface soil ranges from 6 to 12 inches. The subsoil ranges in color from brownish yellow to strong brown and in texture from fine sandy clay loam to fine sandy clay.

This soil is very erodible, and small localized areas have lost about 50 percent of their original surface soil. The subsoil is moderately to slowly permeable.

This soil has a moderately high moisture-holding capacity. It is medium acid; the pH is 5.6. Calcium and phosphorus are medium, magnesium and potassium are low, and organic matter is about 1.5 percent.

Marlboro fine sandy loam, nearly level phase, is one of the best soils in Duplin County. It is suitable for all crops grown in the county, and yields are above average (fig. 8). It is not an extensive soil, but all of it has been cleared and is in cultivation. It is in capability unit I-1.



Figure 8.—Marlboro fine sandy loam is especially favored for strawberries because they mature earlier on this soil than on the less well-drained soils.

Marlboro fine sandy loam, gently sloping phase (2 to 5 percent slopes) (Mf).—The risk of erosion is greater on this soil than on the nearly level phase because of stronger slopes and faster runoff. This soil is most commonly associated with the gently sloping phases of the Magnolia, Norfolk, Ruston, and Duplin series, and with the other soils of the Marlboro series. From the standpoint of the number of suitable crops and the yields produced, this soil is one of the best in the county. All of it has been

cleared and is in cultivation. Management practices that will improve and maintain fertility and control runoff and erosion are needed. This soil is in capability unit IIe-1.

Marlboro fine sandy loam, eroded gently sloping phase (2 to 5 percent slopes) (Mg).—Most areas of this soil have lost from 25 to 75 percent of their original surface soil through erosion. Tillage has mixed the subsoil with the remaining surface soil. The color of the plow layer is now yellowish or brownish yellow; the texture is heavy fine sandy loam or fine sandy clay loam. A crust forms when the surface is moistened. This soil has faster runoff and higher erosion hazard than Marlboro fine sandy loam, gently sloping phase. In distribution and association with other soils, this soil is like the gently sloping phase.

All of Marlboro fine sandy loam, eroded gently sloping phase, has been cleared and is in cultivation. It is in capability unit IIe-1.

MIXED ALLUVIAL LAND

Mixed alluvial land, poorly drained (0 to 2 percent slopes) (Mh).—This miscellaneous land type is on stream alluvium. It is on flood plains along the major streams and is flooded during periods of high water. The water table is at or near the surface except in areas that are slightly higher than the surrounding flood plain. The streambanks, the natural levees, which in some areas form the streambanks, and the banks of oxbow lakes and of old stream channels are fairly well drained and form islands of exposed Mixed alluvial land, poorly drained, when streams first overflow.

Mixed alluvial land, poorly drained, occurs in association with Swamp, but it is better drained because it is on the higher parts of the first bottoms. In some places, it is leveled; in others it consists of a series of ridges and valleys formed by old stream channels and by the high banks of old channels.

This miscellaneous land type varies considerably in profile. In most places it shows some stratification because of its origin from alluvial deposits. The texture varies from sand to fine sandy loam or to light clay loam. The profile may be sand underlain by finer textured material, or the reverse. The color is generally light gray, but it will grade toward yellowish brown or almost black.

This land is nearly all in forest; the value for agriculture is low. In pioneer days, many areas of Mixed alluvial land, poorly drained, were used for rice. No attempts are now made to use the land for crops or pasture. The risk of overflow is great, and until stream channels are improved, forest is the best use for this soil. It is in capability unit IVw-1.

Mixed local alluvial land (0 to 2 percent slopes) (Mk).—This mapping unit consists of local colluvial and alluvial material that has washed from adjacent slopes. The material is somewhat poorly drained and occurs at the base of slopes and at the heads of streams. It is associated with Goldsboro, Norfolk, Marlboro, Duplin, Ruston, Caroline, and Craven soils. The vegetation is a mixture of loblolly pine, oak, gum, and water-tolerant shrubs.

The surface soil is usually dark-gray loamy fine sand or fine sandy loam. The subsoil is stratified sand, sandy loam, and organic matter. This horizon is frequently underlain by the buried profile of another soil. The

thickness of the colluvial and alluvial deposits ranges from 15 to 50 inches.

If cultivated, this miscellaneous land type should be artificially drained and protected from the runoff from adjacent slopes. Drained areas can be used for corn, soybeans, fescue, and Ladino clover. Small areas of this land are in cultivation where they are surrounded by better soils. Mixed local alluvial land is in capability unit IVw-1.

MYATT SERIES

Soils of the Myatt series have formed from old stream alluvium that washed from Coastal Plain uplands. They occupy low terraces along the larger streams. They occur in association with Izagora, Kalmia, Okenee, and Stough soils, and with the terrace phase of Plummer fine sand. Slopes range from 0 to 2 percent, though they are mostly 1 percent or less. Myatt soils are poorly drained. Runoff is slow to very slow. Internal drainage is slow to very slow because of the high water table. The soils are subject to occasional overflow. The vegetation consists of gum, swamp maple, hornbeam, willow, an occasional loblolly pine, and water-tolerant shrubs.

Myatt fine sandy loam (0 to 2 percent slopes) (Mm).—This soil occupies terraces along major streams of the county, mainly the Northeast Cape Fear River. It is a minor soil in area and distribution.

The following is a profile description of Myatt fine sandy loam in a forested area:

- 0 to 14 inches, dark grayish-brown fine sandy loam, fairly high in organic matter; friable.
- 14 to 36 inches, mottled light brownish-gray and yellowish-brown fine sandy loam; weak medium subangular blocky structure; friable.
- 36 to 42 inches+, yellowish-brown fine sandy clay loam, mottled with gray; weak medium subangular blocky structure; friable; some stratification.

The surface ranges from gray to dark gray, depending on the content of organic matter. The subsoil varies in color and in degree of mottling. In the more poorly drained positions, the mottles are mainly gray; in better drained positions, the yellowish and brownish mottles are more abundant. The subsoil texture may be a fine sandy loam or a fine sandy clay loam. In a few areas the soil is underlain by a sand substratum at depths of about 30 to 42 inches.

Very little of this soil has been cleared. When drained, the soil is good for cultivation. However, draining this soil is difficult because of its low topographic position, high water table, and overflow hazard. The soil is in capability unit IIIw-3.

Myatt loamy fine sand (0 to 2 percent slopes) (Mn).—This soil differs from the Myatt fine sandy loam in having a somewhat darker surface soil and in being coarser textured throughout the profile. The surface soil is dark gray to very dark gray loamy fine sand. The subsoil is gray or mottled gray and yellowish-brown loamy fine sand or fine sandy loam. As in Myatt fine sandy loam, the water table is high. Extent, distribution, and association of soils are also similar for the two soils. Myatt loamy fine sand is in capability unit IIIw-3.

NORFOLK SERIES

Soils of the Norfolk series have developed from sand and sandy clay members of the Coastal Plain formations. They are well-drained soils of uplands and are common in

all parts of the county except the south-central and south-eastern parts, where relatively small areas occur. They are associated with the related Goldsboro and Lynchburg soils, and with soils of the Marlboro, Duplin, Dunbar, Ruston, Caroline, Craven, Lakeland, and Klej series. Slopes range mainly from 0 to 8 percent, but on escarpments and ridges slopes range up to 17 percent or more. The vegetation is a mixture of loblolly and longleaf pines and a few oaks, hickory, dogwood, and sweetgum. Areas of Norfolk soils that have been cleared and abandoned support a growth consisting mainly of loblolly pine mixed with longleaf and shortleaf pines. Norfolk soils are some of the most extensive and important soils of Duplin County.

Norfolk fine sandy loam, nearly level phase (0 to 2 percent slopes) (Na).—This well-drained soil occurs on broad interstream areas. It is one of the best soils in Duplin County and is nearly all in cultivation.

The following is a profile description of Norfolk fine sandy loam, nearly level phase, in a wooded area:

- 0 to 3 inches, dark-gray loamy fine sand; very friable.
- 3 to 15 inches, light yellowish-brown loamy fine sand; friable.
- 15 to 18 inches, yellowish-brown light fine sandy clay loam; weak medium subangular blocky structure; friable.
- 18 to 30 inches, dark yellowish-brown fine sandy clay loam; weak medium subangular blocky structure; friable.
- 30 to 42 inches, yellowish-brown fine sandy loam; weak medium subangular blocky structure; friable.
- 42 to 48 inches+, yellowish-brown fine sandy clay loam, mottled with red and strong brown; mottles are common, medium, and distinct.

The surface soil ranges in thickness from 8 to 18 inches and in texture from loamy fine sand to fine sandy loam. The color of the subsoil ranges from yellowish brown to strong brown or reddish yellow as it grades toward the Ruston soil.

This soil has a moderately permeable subsoil and a moderately high moisture-holding capacity. It is low in natural fertility and strongly acid; the pH is 5.2. The content of magnesium and potassium is low, and that of calcium and phosphorus is medium. The organic-matter content is about 1.5 percent in the surface soil.

Norfolk fine sandy loam, nearly level phase, is easily improved and its fertility can be kept at a high level. It is suitable for all crops grown in the county; yields are high under ordinary management. It is in capability unit I-1.

Norfolk fine sandy loam, gently sloping phase (2 to 5 percent slopes) (Nb).—This soil differs from the nearly level phase of Norfolk fine sandy loam in slopes. In addition, the flow of runoff is greater and faster. Distribution, suitability for crops, and yields are about the same for the two soils. In addition to crop rotations and proper fertilization, this soil needs terraces and contour tillage to control runoff and erosion. It is a minor soil in total area, but most of it is in cultivation. It is in capability unit IIe-1.

Norfolk fine sandy loam, eroded gently sloping phase (2 to 5 percent slopes) (Nc).—This soil differs from the nearly level phase of Norfolk fine sandy loam in erosion and slopes. Most areas have lost 25 to 75 percent of the original surface soil through erosion. Some spots have lost all of it. Tillage has mixed the yellowish-brown subsoil with the remaining original surface soil. The plow layer is now spotted and consists of heavy fine sandy loam or fine sandy clay loam, depending on the amount of original surface soil lost. Because of the

eroded condition, the surface tends to crust after wetting. Runoff is therefore faster and greater than from the nearly level or gently sloping phases of Norfolk fine sandy loam. Yields of crops are also slightly less. When cultivated this soil should be protected from runoff and erosion.

All of the Norfolk fine sandy loam, eroded gently sloping phase, has been cleared, and most of it is in cultivation. A small percentage has reverted to loblolly pine forest. Distribution is the same as for the nearly level and gently sloping phases. This soil is in capability unit IIe-1.

Norfolk fine sandy loam, sloping phase (5 to 8 percent slopes) (Nd).—This soil occurs on marine-terrace escarpments, stream breaks, and ridges. It differs from the nearly level phase of Norfolk fine sandy loam chiefly in slopes. Small areas are included that have stronger slopes; a few exceed 17 percent. The areas having stronger slopes are mostly in forest. Runoff is faster and the erosion hazard is greater on this soil than on the nearly level and gently sloping phases of Norfolk fine sandy loam. Small localized areas have lost less than 25 percent of their original surface soil. The extent of this soil is very small, and less than half is in cultivation. The soil is in capability unit IIIe-1.

Norfolk fine sandy loam, eroded sloping phase (5 to 8 percent slopes) (Ne).—This soil occurs on marine-terrace escarpments, stream breaks, and ridges. It differs from the nearly level phase in slopes and erosion. Some areas are included with this soil that have slopes of 17 percent or more. From 25 to 75 percent of the original surface soil has been lost through erosion; in local areas the loss has been greater. The plow layer is now spotted and finer textured because the subsoil has been mixed in tillage with the remaining surface soil. The texture of the plow layer ranges from heavy fine sandy loam to fine sandy clay loam, depending on the amount of subsoil mixed with it. The surface has a tendency to crust after wetting. Runoff is faster than on the nearly level and gently sloping phases of Norfolk fine sandy loam. When cultivated this soil requires intensive conservation to protect it from erosion. It is very minor in extent and is mostly in cultivation. It is in capability unit IIIe-1.

Norfolk loamy fine sand, nearly level thick surface phase (0 to 2 percent slopes) (Nf).—This extensive well-drained soil occurs on flat uplands in all of the county except the south-central part. It differs from Norfolk fine sandy loam, nearly level phase, in thickness and texture of the surface soil. The texture is loamy fine sand or fine sand. The thickness of surface soil ranges from 18 to 30 inches, compared with the range of 8 to 18 inches in Norfolk fine sandy loam, nearly level phase.

Runoff is slow to very slow because of the nearly level slopes and thickness of surface soil. The moisture-holding capacity is moderately low, and the soil is slightly droughty. The soil is subject to wind erosion. Wind removes soil and exposes seed in one part of the field and covers it too deeply in another part. Growing plants are damaged by moving soil particles. Norfolk loamy fine sand, nearly level thick surface phase, is in capability unit IIIs-1.

Norfolk loamy fine sand, gently sloping thick surface phase (2 to 5 percent slopes) (Ng).—This soil differs from the nearly level thick surface phase in slopes. Because of the thick surface soil, there is little runoff,

except during heavy or prolonged rains. This soil has the same general distribution, is associated with the same soils, and is subject to the same wind-erosion hazards as the nearly level thick surface phase of Norfolk loamy fine sand. This gently sloping thick surface phase is fairly extensive, and much of it is in cultivation. It is in capability unit IIIs-1.

Norfolk loamy fine sand, sloping thick surface phase (5 to 8 percent slopes) (Nh).—This widely distributed soil occurs on or adjacent to escarpments or ridges. It is similar to the nearly level thick surface phase except in slope. Small areas are included that have slopes of 8 to 12 percent. Because of stronger slopes, this phase has greater runoff than the nearly level and the gently sloping thick surface phases of Norfolk loamy fine sand. Consequently it is more droughty and average crop yields are less. This soil is associated with the gently sloping and sloping phases of Ruston and Lakeland soils and the thick surface phases of the Goldsboro and Lynchburg soils. It is rarely associated with the Marlboro, Caroline, Craven, and Klej soils. It is fairly extensive, and much of it is in cultivation.

Because of droughtiness, supply of plant nutrients, and the hazard of wind erosion, the soil is classified in capability unit IIIs-1.

OKENEE SERIES

Soils of the Okenee series have developed from old alluvium that washed from Coastal Plain uplands. They occur on low terraces along the larger streams. Slopes range from 0 to 2 percent but rarely exceed 1 percent. Okenee soils are very poorly drained, have a high water table, and are subject to occasional overflow. They occur in association with the Stough and Myatt soils; the terrace phase of the Plummer soils; Swamp; and Mixed alluvial land, poorly drained. The vegetation consists of gum, swamp maple, willow, hornbeam, oak, and pond pine. These soils are not extensive, and only a very few acres are cultivated.

Okenee loam (0 to 2 percent slopes) (Ob).—This soil usually has a high water table and is subject to occasional overflow. Runoff is slow to ponded. Internal drainage is slow, mainly because of the low topographic position and the high water table.

The following is a profile description of Okenee loam in a wooded area:

0 to 26 inches, black organic loam; friable.

26 to 44 inches +, very dark gray fine sandy loam; friable.

The surface soil ranges in thickness from 12 to 26 inches; it ranges in color from black to dark gray, depending on the content of organic matter. The subsoil texture ranges from fine sandy loam to fine sandy clay loam. A sandy substratum is present in places.

This soil is hard to drain because of its low topographic position. However, in other parts of the State where it occurs on higher elevations, the soil is successfully drained and used for crops. Suitable crops are corn, soybeans, truck, Ladino clover, and fescue. If stream channels were improved, much of this soil could be adequately drained. It is strongly acid and low in plant nutrients, and it has a moderately high moisture-holding capacity. The soil is in capability unit IIIw-4.

Okenee fine sandy loam (0 to 2 percent slopes) (Oa).—This soil differs from the Okenee loam in texture, color, and thickness of surface soil. Thickness is less and the

color is lighter. Drainage, overflow hazard, depth to water table, distribution, topographic position, and association with other soils are the same for both soils. Okenee fine sandy loam is in capability unit IIIw-4.

ONA SERIES

Soils of the Ona series have developed from sandy beds of Coastal Plain formations. They occur as small areas on flat uplands in the southern and eastern parts of the county. Associated soils are of the Leon, Immokalee, Klej, Woodstown, Dragston, Fallsington, Rains, Lynchburg, and Rutlege series. Slopes range from 0 to 2 percent. The soils are moderately well drained to somewhat poorly drained and have incipient hardpans. The vegetation consists of loblolly and shortleaf pines, turkey oak, myrtle, gallberry, huckleberry, and other shrubs. These soils are partly in cultivation.

Ona fine sand (0 to 2 percent slopes) (Oc).—This nearly level soil has slow runoff and medium to slow internal drainage. It is one of the less desirable soils in the county.

The following is a profile description of Ona fine sand in a wooded area:

- 0 to 8 inches, very dark gray fine sand; has salt-and-pepper appearance; loose.
- 8 to 16 inches, very dark brown fine sand; massive structure; pan layer weakly cemented by organic matter; firm and brittle.
- 16 to 36 inches, light brownish-gray fine sand mottled with light olive brown and strong brown; loose.
- 36 to 42 inches +, light-gray fine sand; loose.

The pan layer varies from 2 to 12 inches in thickness. Where this layer is thin, it is lighter in color and is only stained or slightly cemented by organic matter (fig. 9). The strength of cementation increases with the thickness of the pan layer. The underlying sand layer may be yellowish where the soil is a little better drained.

This soil is strongly acid and low in plant nutrients. It requires drainage for cultivation. The total acreage is small, but a considerable part of it is in cultivation. The commonly grown crops are corn, soybeans, vegetable crops, and small fruits. Yields are generally low. The soil is in capability unit IVw-2.

Ona loamy fine sand (0 to 2 percent slopes) (Od).—This soil differs from the Ona fine sand in having finer textured surface soil. It is a better soil than Ona fine sand, and yields average slightly higher. However, it is considered to be one of the poorer soils in the county, and very little of it is in cultivation. It is strongly acid and low in plant nutrients, and it needs drainage for cultivation. It has the same general distribution, topographic position, and drainage as Ona fine sand. The soil is in capability unit IIIw-3.

PAMLICO SERIES

The Pamlico series consists of organic soils. They occur on interstream areas in the southern part of the county. The largest area is in Angola Bay, on the Wicomico terrace. Another area is the Kenan Pocosin. Associated soils are of the Bayboro, Pocomoke, Portsmouth, and Rutlege series. Slopes are nearly level, and the soils are very poorly drained. Runoff is ponded much of the time. However, during prolonged droughts, the muck dries and may catch fire. In some areas the muck has burned down to the mineral material. The vegetation consists of cypress, juniper, pond pine, gum, and a brush undergrowth



Figure 9.—Profile of Ona fine sand.

of American cyrilla (*Cyrilla racemiflora*), green zenobia (*Zenobia nuda*), fetterbush (*Lyonia lucida*), laurel green-brier (*Smilax laurifolia*), Virginia chainfern (*Woodwardia virginica*), loblollybay gordonia (*Gordonia lasianthus*), and other plants. The soils are not in cultivation.

Pamlico muck (0 to 2 percent slopes) (Pa).—The following is a profile description of Pamlico muck in a wooded area in Angola Bay:

- 0 to 4 inches, black organic matter consisting of partly decomposed leaves and marsh grass.
- 4 to 46 inches, black organic matter with considerable charcoal and some sand; percentage of sand increases with depth.
- 46 inches +, gray sand, fine sandy loam, or fine sandy clay loam.

The thickness of the organic layer ranges from 40 to 60 inches; in small areas it may be more than 60 inches. The underlying material may consist of sand, sandy loam, or sandy clay loam or of strata containing these textures. Pamlico muck is very strongly acid, and it has a high moisture-holding capacity. Pamlico muck must be drained before it can be cultivated, but it has not been drained or cultivated successfully in Duplin County. In other counties, efforts to drain and to use this soil have been of limited success. Pamlico muck is in capability unit IVw-1.

Pamlico muck, shallow phase (0 to 2 percent slopes) (Pb).—This soil differs from Pamlico muck only in thick-

ness of the organic layer. The thickness of this layer ranges from 24 to 40 inches, whereas that of Pamlico muck is more than 40 inches. Drainage, occurrence, distribution, and association are the same for both soils. The shallow phase of Pamlico muck is in capability unit IVw-1.

PLUMMER SERIES

Soils of the Plummer series have developed from sand beds of the Coastal Plain formations. They occupy uplands and occur as small areas throughout the county, but they are mainly in the southern and southeastern parts. Associated soils are of the Dragston, Fallsington, Klej, Lynchburg, Pocomoke, Rains, and Rutlege series. Slopes are usually less than 2 percent; small areas may have slopes of 5 percent. Plummer soils are poorly drained to somewhat poorly drained, and runoff is slow. Most Plummer soils have been cut over. The vegetation now consists of scattered scrub oak, gum, loblolly pine, bay, myrtle, wiregrass, pitcher plant, and Venus-flytrap. Very little of the Plummer series is in cultivation.

Plummer fine sand (0 to 2 percent slopes) (Pc).—This is one of the poorer soils in the county.

The following is a profile description of Plummer fine sand in a wooded area:

- 0 to 8 inches, very dark gray fine sand; loose.
- 8 to 21 inches, gray fine sand; loose.
- 21 to 40 inches+, light-gray fine sand, mottled with brownish yellow; loose.

Color of surface soil ranges from light gray to very dark gray. In places the entire profile may be uniformly light gray or gray.

The soil is strongly acid and has a pH of 5.5. It is medium in content of magnesium, low in phosphorus, and very low in potassium. About 3 percent of the surface soil is organic matter. The areas of this soil in cultivation are usually small and are surrounded by better soils. Plummer fine sand is in capability unit IVw-2.

Plummer fine sand, terrace phase (0 to 2 percent slopes) (Pd).—This poorly drained soil has formed from old alluvium that washed from Coastal Plain formations. It occurs on low, nearly level terraces along the larger streams. It differs from Plummer fine sand in topographic position and parent material. Plummer fine sand, terrace phase, is associated with other terrace soils of the Izagora, Kalmia, Myatt, and Okenee series and the terrace phases of the Lakeland and Klej series. Very little of the terrace phase of Plummer fine sand is in the county, and only a few acres are in cultivation. The soil has a high water table and is subject to occasional overflow. It is one of the less desirable soils and is in capability unit IVw-2.

Plummer loamy fine sand (0 to 2 percent slopes) (Pe).—This soil differs from Plummer fine sand in texture. The entire profile is loamy fine sand.

The soil needs artificial drainage if it is cultivated or used for forage crops. When this soil is adequately drained and properly managed, yields of crops are about average. Only a small acreage is in cultivation. The soil is in capability unit IIIw-3.

POCOMOKE SERIES

Soils of the Pocomoke series have developed on interbedded sands and light sandy clays of the Coastal Plain formations. They occur on low upland flats, mainly on the Wicomico terrace in the southern and southeastern

parts of the county. Associated soils are of the Dragston, Fallsington, Lynchburg, Plummer, Portsmouth, Rains, and Rutlege series. Slopes range from 0 to 2 percent. Runoff is slow to very slow, depending on slopes. The soil is very poorly drained. Internal drainage is slow to very slow because of the nearly flat relief and high water table. Native vegetation consists of loblolly pine, water and red oaks, sweetgum, holly, bay, myrtle, and other water-tolerant trees and shrubs. Only one soil type is mapped in this series in Duplin County.

Pocomoke loam (0 to 2 percent slopes) (Pf).—This soil is suitable for cultivation if it is drained.

The following is a profile description of Pocomoke loam in a wooded area:

- 0 to 6 inches, black loam, high in organic matter; fragments of charcoal; friable.
- 6 to 15 inches, black fine sandy loam; friable.
- 15 to 30 inches, very dark gray fine sandy loam; friable.
- 30 to 42 inches+, very dark gray loamy fine sand, mottled with light gray; friable.

The black surface soil varies in thickness, but it rarely exceeds 24 inches. The subsoil ranges from light fine sandy loam to heavy fine sandy clay loam. The substratum ranges from sand to sandy loam.

The moisture-holding capacity is moderately high. Permeability of the subsoil is moderate. The soil is strongly acid and low in plant nutrients. If the soil is adequately drained, yields of crops are better than average. Drainage is a problem because the sandy substratum flows with the water and clogs ditches. The soil is potentially valuable for farming, but very little of it has been cleared. It is in capability unit IIIw-4.

PORTSMOUTH SERIES

Soils of the Portsmouth series have developed from sands and sandy clays of the Coastal Plain formations. They occur on nearly level upland and in bays throughout the county, but they are mainly in the northern and eastern parts. Associated soils are of the Rains, Lynchburg, Rutlege, St. Johns, Pocomoke, Dragston, and Fallsington series. Slopes range from 0 to 2 percent but are mainly 1 percent or less. The Portsmouth soils are very poorly drained. Internal drainage is slow or very slow; runoff is slow or ponded. Native vegetation is loblolly and pond pines, cypress, gum, holly, swamp maple, bay, myrtle, huckleberry, and other water-tolerant shrubs. Only a small acreage of these soils is in cultivation.

Portsmouth loam (0 to 2 percent slopes) (Pg).—This soil must be drained for cultivation.

The following is a profile description of Portsmouth loam in a wooded area:

- 1 to 6 inch, slightly altered leaves and twigs.
- 0 to 15 inches, black loam; friable.
- 15 to 18 inches, very dark gray heavy fine sandy loam; friable.
- 18 to 42 inches+, gray fine sandy clay loam; firm.

The thickness of surface soil ranges from 8 to 24 inches. The subsoil ranges in color from gray to very dark gray and, locally, may have a few mottles of yellow or yellowish brown.

This soil is moderately permeable and has a moderately high moisture-holding capacity. It is high in content of calcium, medium in magnesium and phosphorus, and very low in potassium. The organic-matter content is about 4.0 percent. The soil is strongly acid; the pH is about 5.2. If adequately drained, this soil is good for

corn, soybeans, vegetables, and potatoes. Only a small acreage of Portsmouth loam is in cultivation. The soil is in capability unit IIIw-4.

Portsmouth mucky loam (0 to 2 percent slopes) (Ph).—This soil differs from Portsmouth loam in that the surface soil has more organic matter, and some small areas may be muck. Distribution, association of soils, drainage, and agricultural potentialities of the two soils are similar. Portsmouth mucky loam is in capability unit IIIw-4.

RAINS SERIES

Soils of the Rains series have developed from sands and sandy clays of the Coastal Plain formations. They occur on upland flats and in shallow depressions in all parts of the county, but they are less common in the southern and southeastern parts. Associated soils are members of the Goldsboro, Lynchburg, Portsmouth, Pocomoke, Fallsington, Dragston, and Woodstown series, and the sandy clay subsoil phase of the Coxville series. The Rains soils range from 0 to 2 percent in slope. They are poorly drained. Internal drainage is slow to very slow; runoff is slow to ponded. The native vegetation consists of loblolly pine, gum, swamp maple, myrtle, bay, and other water-tolerant plants. These soils are extensive, and a fair percentage is in cultivation.

Rains fine sandy loam (0 to 2 percent slopes) (Ra).—This is one of the more extensive soils in the county. It needs drainage for cultivation (fig. 10).

The following is a profile description of Rains fine sandy loam in a forested area:

- 1 to 0 inch, very dark brown leaves and twigs, partially decomposed.
- 0 to 4 inches, black and very dark grayish brown fine sandy loam; friable.
- 4 to 8 inches, gray and very dark grayish brown fine sandy loam; friable.
- 8 to 28 inches, mottled gray, yellowish-red, and yellowish-brown light fine sandy clay loam; medium subangular blocky structure; slightly hard when dry, slightly sticky and plastic when moist.
- 28 to 38 inches, mottled gray, yellowish-red, and yellowish-brown fine sandy clay loam; medium weak angular blocky structure; hard when dry, plastic when wet.
- 38 to 48 inches +, gray fine sandy clay loam; massive structure; hard when dry, plastic when moist.

The color of the surface is lighter in cultivated fields; the thickness ranges from 6 to 18 inches. The texture of the subsoil ranges from fine sandy loam to fine sandy clay loam, and the color ranges from gray to dark gray.

This soil is strongly acid; the pH is 5.3. It is medium in content of calcium and magnesium, high in phosphorus, and low in potassium. The organic-matter content is about 2.7 percent. If adequately drained, Rains fine sandy loam is one of the better soils of the county and is suitable for corn, small grains, soybeans, vegetables, strawberries, and forage crops. Yields are better than average. Rains fine sandy loam is very important agriculturally in areas where it commonly occurs, and much of it is in cultivation. It is in capability unit IIw-3.

Rains loamy fine sand, thick surface phase (0 to 2 percent slopes) (Rb).—This soil differs from Rains fine sandy loam in having a thicker and a coarser textured surface soil. The thickness of surface soil ranges from 18 to 30 inches, whereas that of the fine sandy loam ranges from 6 to 18 inches. Because of the thicker surface soil, this soil has a lower moisture-holding capacity, and



Figure 10.—A good stand of loblolly pine on Rains fine sandy loam.

when drained, tends to be somewhat droughty in dry weather. It responds to good management. Crops suited to this soil are the same as those suited to Rains fine sandy loam, but average yields are slightly less. The total acreage is small, and only a small percentage is in cultivation. The soil is in capability unit IIIw-3.

RUSTON SERIES

Soils of the Ruston series have developed on interbedded sands, sandy clays, and gravel of the Coastal Plain formations. These upland soils are widely distributed and are among the best in the county. They occur mainly on or adjacent to stream breaks and on or adjacent to escarpments of the Coharie and Sunderland terraces. They occur on the Wicomico terrace to a lesser extent. Associated soils are members of the Norfolk, Marlboro, Magnolia, Kenansville, Caroline, Craven, and Lakeland series. The Ruston soils occupy every type of relief in the county, from the nearly level to the steepest slopes. They are well drained. Internal drainage is medium; runoff is slow to rapid, depending on the texture and thickness of surface soil and the steepness of slopes. The native vegetation is mainly loblolly and shortleaf pines, mixed with white, red, blackjack, and turkey oaks. Most of this soil has been cleared, and a large percentage of it is still in cultivation. Some of the cleared acreage has reverted to pine forest.

Ruston fine sandy loam, nearly level phase (0 to 2

percent slopes) (Rc).—This soil is not extensive and is all in cultivation.

The following is a profile description of Ruston fine sandy loam, nearly level phase, in a cleared field:

- 0 to 6 inches, dark grayish-brown loamy fine sand; friable.
- 6 to 16 inches, pale-olive loamy fine sand; friable.
- 16 to 20 inches, yellowish-red fine sandy clay loam; moderately developed medium subangular blocky structure; friable.
- 20 to 42 inches, yellowish-red fine sandy clay loam; moderately developed medium subangular blocky structure; friable.
- 42 to 48 inches, mottled yellowish-red, light yellowish-brown, and light-gray heavy fine sandy clay loam; moderately developed medium angular blocky structure; hard when dry, sticky and slightly plastic when wet.

The surface soil ranges from 6 to 18 inches in thickness and from loamy fine sand to fine sandy clay loam in texture. Some areas have gravelly surface soil, but few have enough gravel to interfere with cultivation. Slopes of about 2 percent have been damaged slightly by erosion.

This soil has moderately rapid permeability in the subsoil. It has a moderately high moisture-holding capacity. It is strongly acid; the pH is about 5.5. The amount of calcium is high; that of magnesium is low, phosphorus medium, and potassium very low. The organic-matter content is about 1 percent.

This soil can be easily improved and can be kept at a high level of fertility. It is suitable for all crops grown in the county, but those most commonly grown are tobacco, corn, cotton, soybeans, and truck crops. In addition, the soil is suitable for crops not commonly grown, such as alfalfa and peaches. Under ordinary management yields are high. The soil is especially prized for tobacco, because of the good quality and high yield. It is in capability unit I-1.

Ruston fine sandy loam, gently sloping phase (2 to 5 percent slopes) (Rd).—This soil has the same profile characteristics as the nearly level phase of Ruston fine sandy loam but differs in slope. Runoff from the stronger slopes is faster. Some areas have lost as much as 25 percent of their original surface soil through sheet erosion. The surface soil contains gravel in some areas, but not enough to interfere with cultivation.

If cultivated, this soil needs fertilization and rotation of crops. In addition, it needs terracing and tillage along the contour to control runoff and to conserve moisture. If this soil is properly managed, yields of most crops should be as good as those of the nearly level phase.

Practically all this soil has been cleared and is used for most crops grown in the county. Tobacco, corn, cotton, soybeans, truck crops, and small grains are most common. This soil is in capability unit IIe-1.

Ruston fine sandy loam, eroded gently sloping phase (2 to 5 percent slopes) (Re).—This soil differs from the nearly level phase of Ruston fine sandy loam in slope and in erosion. Most areas have lost 25 to 75 percent of the original surface soil; nearly all the soil has been lost in some areas. Subsoil has been mixed with the remaining surface soil in tillage, and the plow layer is now reddish. The present surface soil texture is finer, and it varies from fine sandy loam to fine sandy clay loam, depending on the amount of subsoil that has been mixed with it. Local areas are slightly gravelly. The present surface soil tends to form a crust after becoming wet. Runoff is medium to rapid because of slopes and the finer texture of the surface soil. Cultivated areas require erosion control and conservation of moisture.

Most of the soil is in cultivation and is used for all crops commonly grown in the county. Yields average slightly less than from the nearly level, gently sloping, and sloping phases of Ruston fine sandy loam. The soil is in capability unit IIe-1.

Ruston fine sandy loam, sloping phase (5 to 8 percent slopes) (Rf).—This soil mainly occurs as small areas in the upland. It differs from the nearly level phase of Ruston fine sandy loam only in slopes. Runoff is rapid, and the soil is susceptible to erosion. In some areas the surface soil contains gravel, but not enough to interfere with tillage. If cultivated, the soil needs protection from erosion and conservation of moisture. Under good management, yields from this soil compare favorably with those from the nearly level phase. The soil is not extensive, and only a small part is in cultivation (fig. 11). It is in capability unit IIIe-1.



Figure 11.—A good stand of loblolly pine on Ruston fine sandy loam.

Ruston fine sandy loam, eroded sloping phase (5 to 8 percent slopes) (Rg).—This soil differs from the nearly level phase of Ruston fine sandy loam in slopes and in erosion. Most areas have lost 25 to 75 percent of the original surface soil; some areas have lost all of it. Subsoil has been mixed with the remaining surface soil, and the plow layer is now a reddish heavy fine sandy loam or fine sandy clay loam. The present surface is spotted because the degree of erosion differs from place to place. The soil crusts after becoming wet, and as a result, stands of

plants are poor. In addition, the erosion hazard is increased by rapid runoff.

Crops suited to this soil are the same as for the nearly level phase, but yields average less. This soil is minor in extent, but nearly all is in cultivation. It is in capability unit IIIe-1.

Ruston fine sandy loam, eroded strongly sloping phase (8 to 12 percent slopes) (Rh).—This soil occupies stream breaks and escarpments, and it includes a few areas having slopes as steep as 17 percent. It differs from the nearly level phase of Ruston fine sandy loam in slopes and erosion. Most areas have lost from 25 to 75 percent of the original surface soil. Localized areas have lost all the surface soil and part of the subsoil through sheet erosion. The plow layer is now a reddish brown or brown, depending on the degree of erosion. The variation in color gives fields a spotted appearance. The texture of the plow layer is fine sandy loam or fine sandy clay loam, depending on the amount of subsoil that has been mixed with it. Some small areas are gravelly. The surface soil crusts after becoming wet. Because of the stronger slopes, runoff is rapid and the risk of erosion is great. The soil is not recommended for continuous cultivation. Most cleared areas have reverted to pine trees. This soil is in capability unit IVe-1.

Ruston loamy fine sand, nearly level thick surface phase (0 to 2 percent slopes) (Rk).—This soil differs from Ruston fine sandy loam, nearly level phase, in texture and thickness of the surface soil. The texture is generally coarser and ranges from loamy fine sand to fine sand; the thickness ranges from 18 to 30 inches, compared with a range of 6 to 18 inches for Ruston fine sandy loam, nearly level phase. Runoff is slow to very slow because of the coarser texture and greater thickness of the surface soil and the nearly level slopes. Wind erosion is a hazard, particularly in spring and early in summer. This soil is slightly droughty, but most of it is in cultivation. Yields average somewhat less than on Ruston fine sandy loam, nearly level phase. This soil is in capability unit IIs-1.

Ruston loamy fine sand, gently sloping thick surface phase (2 to 5 percent slopes) (Rm).—This soil differs from the nearly level thick surface phase of Ruston loamy fine sand in slopes and in rate of runoff, which is slow to medium. The distribution, occurrence, extent, crops, and average yields of the two soils are very much the same. This soil differs from Ruston fine sandy loam, nearly level phase, in texture and thickness of the surface soil and in slopes. Much of this soil is in cultivation. It is in capability unit IIs-1.

Ruston loamy fine sand, sloping thick surface phase (5 to 8 percent slopes) (Rn).—This soil occupies stream breaks, terrace escarpments, and ridges. It differs from Ruston loamy fine sand, nearly level thick surface phase, in slopes. It has somewhat greater runoff than the nearly level thick surface phase and the gently sloping thick surface phase of Ruston loamy fine sand. It has about the same average yields as these two soils. It differs from Ruston fine sandy loam, nearly level phase, in slopes and in having a coarser and thicker surface soil. Local areas have lost from 25 to 50 percent of the surface soil. Wind erosion is a hazard, particularly in spring and early in summer. This soil is not extensive, but it is widely distributed. About 50 percent has been cleared. The soil is in capability unit IIIs-1.

Ruston loamy fine sand, strongly sloping thick surface

phase (8 to 12 percent slopes) (Ro).—This soil differs in slopes from the other thick surface phases of Ruston loamy fine sand. It differs from the Ruston fine sandy loam, nearly level phase, in slopes and in having a coarser and thicker surface soil. Included with Ruston loamy fine sand, strongly sloping thick surface phase, are small areas with slopes of 17 percent or more that occupy escarpments and stream breaks. Because of steeper slopes and greater runoff, this phase is more droughty than the other thick surface phases of Ruston loamy fine sand. Wind erosion is a hazard in spring and early in summer. The total area is small, and most of it is in forest. This soil is in capability unit IVs-1.

RUTLEGE SERIES

Soils of the Rutlege series have developed from sandy members of the Coastal Plain formations. They are on broad upland flats and bays. They occur throughout the county but are less common in the southeastern part. Slopes range from 0 to 2 percent but rarely exceed 1 percent. Associated soils are of the Plummer, Pocomoke, Portsmouth, Leon, and St. Johns series, and Pamlico muck. The native vegetation is pond pine, gum, swamp maple, cypress, bay, briers, huckleberry, and other water-tolerant plants. Rutlege soils are fairly extensive, but very little of their area is in cultivation. They are very poorly drained.

Rutlege loam (0 to 2 percent slopes) (Rp).—This is one of the common soils of the shallow upland depressions, or bays. It occurs throughout the county, chiefly in the central part. Slopes are usually less than 1 percent; runoff is very slow or ponded.

The following is a profile description of Rutlege loam in a forested area:

- 0 to 5 inches, black organic loam composed of leaves, twigs, roots, and sand.
- 5 to 8 inches, very dark grayish brown fine sand.
- 8 to 18 inches, gray fine sand.
- 18 to 36 inches, white fine sand.
- 36 to 42 inches, dark-brown fine sand cemented into a pan layer by organic matter; massive structure; soft when wet, hard and brittle when dry.

The black surface layer reaches a maximum of 18 inches in thickness. In some areas the pan is absent; in other areas it occurs at depths greater than 36 inches. In both instances, gray fine sand occurs in the place of white fine sand.

Rutlege loam is very strongly acid, high in organic matter, and low in fertility. It can be cultivated only if it is drained, and even then it is a poor soil. Yields of corn and soybeans from a few small drained areas have been only fair. Blueberries are grown successfully in a few small areas. Rutlege loam is in capability unit IVw-1.

Rutlege loam, thick surface phase (0 to 2 percent slopes) (Rr).—This soil differs from Rutlege loam only in having a thicker organic surface soil. The thickness of the surface soil ranges from 18 to 36 inches, whereas that of Rutlege loam ranges from 8 to 18 inches. The thicker organic surface layer is more flammable in prolonged dry weather. Distribution, occurrence, and extent are similar for the two soils. Very little of this soil is in cultivation. It is in capability unit IVw-1.

Rutlege loamy fine sand (0 to 2 percent slopes) (Rs).—This soil differs from Rutlege loam in texture and thickness of the surface soil. The surface soil is black loamy fine

sand that ranges from 5 to 8 inches in thickness. The pan layer, where present, is at depths ranging from 24 to 40 inches. In contrast, the pan is at depths of 36 inches or more in Rutlege loam. Artificial drainage is required, and very little of the Rutlege loamy fine sand is in cultivation. This soil is very strongly acid and has low fertility and low yields. The two soils are similar in occurrence, distribution, and extent. This soil is in capability class IVw-1.

Rutlege mucky loam, thick surface phase (0 to 2 percent slopes) (Rt).—This soil occurs mostly in bays. It differs from Rutlege loam in having a surface soil that is all mucky loam and 18 to 36 inches thick. In Rutlege loam the organic layer is only 5 to 18 inches thick. In Rutlege mucky loam, thick surface phase, the subsoil is a loamy fine sand and the pan layer—common in Rutlege loam—is usually absent. This soil has a high water table, but during periods of prolonged drought, the surface soil becomes very dry and flammable. The soil is very strongly acid and low in fertility. If drained it is suitable for cultivation, but the crops suited to it are limited. The best use is for blueberries. Very little of this soil is in cultivation. It is in capability unit IVw-1.

ST. JOHNS SERIES

Soils of the St. Johns series have developed from sand beds of the Coastal Plain formations. They are on upland flats and in bays and are very poorly drained. Slopes range from 0 to 2 percent but rarely exceed 1 percent. Associated soils are of the Leon, Plummer, Pocomoke, Portsmouth, and Rutlege series. The native vegetation is pond and loblolly pines, gum, swamp maple, and bay. The underbrush is reeds, myrtle, gallberry, huckleberry, and other water-tolerant shrubs. Only one soil is mapped in this series in Duplin County.

St. Johns loamy fine sand (0 to 2 percent slopes) (Sa).—This poorly drained soil occurs in small areas throughout the county, but it is mainly in the northeastern part on the Wicomico terrace.

The following is a profile of St. Johns loamy fine sand in a wooded area:

- 0 to 7 inches, black loamy fine sand, high in organic matter.
- 7 to 12 inches, gray fine sand; loose.
- 12 to 18 inches, very dark brown fine sand; weakly to strongly cemented hardpan.
- 18 to 30 inches, dark-brown to brown fine sand; weakly cemented pan.
- 30 to 42 inches +, gray fine sand; loose when moist or dry, flows when wet.

Depth to the hardpan layer varies from place to place.

The soil is strongly acid and low in fertility. Drainage is necessary for any agricultural use. Only a small percentage has been cleared, and this is used almost entirely for blueberries, a crop well suited to this soil. A few acres are used for improved pasture, but the forage is poor. The soil is very poor for agriculture. It is in capability unit IVw-1.

STOUGH SERIES

Soils of the Stough series have formed from old alluvium that washed from Coastal Plain uplands. They occur on low terraces along the larger streams and are subject to flooding when water in streams is very high. The frequency of overflow is about 1 year in 10. These soils range from poorly drained to moderately well drained. Slopes range from 0 to 5 percent, but most of them are

less than 2 percent. Associated soils are the Izagora, Kalmia, Myatt, and Okenee, as well as terrace phases of the Klej, Lakeland, and Plummer series. The native vegetation is loblolly pine, gum, maple, and oak. Stough soils are minor in extent and in agricultural importance.

Stough fine sandy loam (0 to 2 percent slopes) (Sb).—Only a small percentage of this somewhat poorly drained soil is cleared. Runoff is slow to medium, depending on slopes. Internal drainage is slow and may be blocked by a high water table. Drainage is required for cultivation. Some small areas that have slopes of 2 to 5 percent are included with this soil. The stronger slopes are a little better drained.

The following is a profile description of Stough fine sandy loam in a cultivated area:

- 0 to 6 inches, dark grayish-brown loamy fine sand; loose.
- 6 to 10 inches, mottled light-gray and pale-yellow loamy fine sand; loose.
- 10 to 24 inches, mottled light-gray and pale-yellow fine sandy clay loam; weak medium subangular blocky structure; firm when moist, slightly plastic when wet.
- 24 to 36 inches, mottled pale-yellow, light-gray, and brownish-yellow fine sandy clay loam; weak medium subangular blocky structure; firm when moist, slightly plastic when wet.
- 36 to 42 inches, light-gray fine sandy clay loam or fine sandy clay, mottled with pale yellow and brownish yellow; massive structure; firm when moist, plastic when wet.

The thickness of the surface soil ranges from 8 to 18 inches, and the texture from loamy fine sand to fine sandy loam. In some places the soil is underlain by a sand substratum.

If adequately drained, the soil is suitable for most crops grown in the county. The low topographic position, the high water table, and the hazard of flooding make an adequate drainage system hard to install and maintain. The soil is strongly acid. It is in capability unit IIw-2.

Stough loamy fine sand, thick surface phase (0 to 2 percent slopes) (Sc).—This soil differs from Stough fine sandy loam in having a coarser and thicker surface soil. The thickness of the surface soil ranges from 18 to 30 inches, and the texture from loamy fine sand to fine sand. The soil is strongly acid. Drainage is required before cultivation. In drained areas the soil becomes dry during droughts because of the thicker and coarser surface soil, and crops are damaged. However, the soil drains more quickly during rainy periods and crops are less likely to be drowned. Drainage problems are similar to those on Stough fine sandy loam. The total extent of this soil is small, but a considerable part is in cultivation. Average yields are somewhat less than from Stough fine sandy loam. Stough loamy fine sand, thick surface phase, is in capability unit IIIw-3.

SWAMP

Swamp (0 to 2 percent slopes) (Sd).—This miscellaneous land type consists of very poorly drained areas on first bottoms along most of the larger streams and along some of the smaller ones. The parent materials are recent deposits of alluvium. Consequently Swamp is usually stratified and without a uniform sequence of layers. In some places the profile is not stratified; instead it consists of a mixture of organic matter, sand, silt, and clay. The soil material of this land type is gray, but the surface is usually darker. The texture ranges from fine sand to sandy clay loam and may change vertically or horizontally within short distances.

Swamp has a high water table, is subject to frequent overflow, and is covered by water much of the time. It is nearly all in a forest of gum and cypress; some areas have been cut over. Swamp soil is potentially good for farming, but it requires drainage. The cost of drainage, however, is not justified at this time. Swamp is in capability unit VIIw-1.

WOODSTOWN SERIES

Soils of the Woodstown series have developed from interbedded sands and sandy clays of the Coastal Plain formations. They occupy broad interstream uplands and are fairly well distributed over the county. However, they are most common on the Wicomico terrace in the southern and southeastern parts. Associated soils are of the related Dragston, Fallsington, and Kenansville series, and of the Goldsboro, Lynchburg, and Norfolk series. Slopes range from 2 to 5 percent. The soils are moderately well drained. The native vegetation is loblolly pine, maple, oak, gallberry, huckleberry, myrtle, and other shrubs. The soils are fairly extensive and are important to agriculture.

Woodstown fine sandy loam, nearly level phase (0 to 2 percent slopes) (Wa).—Much of this moderately well drained soil has been cleared and is in cultivation. It is one of the leading soils in the southern and southeastern parts of the county.

The following is a profile of Woodstown fine sandy loam, nearly level phase, in a forested area:

- 0 to 3 inches, very dark gray fine sandy loam; very friable.
- 3 to 12 inches, pale-yellow fine sandy loam; friable.
- 12 to 20 inches, light yellowish-brown, light fine sandy clay loam; weak, medium subangular blocky structure; slightly sticky and plastic when wet, slightly hard when dry.
- 20 to 28 inches, mottled yellow, pale-yellow, and brownish-yellow fine sandy loam; weak fine subangular blocky structure; friable when moist, soft when dry.
- 28 to 38 inches, mottled white, pale-yellow, and yellow fine sandy loam grading into a fine sand in the lower part; very weak fine subangular blocky structure; very friable when moist, soft when dry.
- 38 to 42 inches +, white fine sand; loose.

The surface soil ranges in texture from fine sandy loam to loamy fine sand and in thickness from 8 to 18 inches. The subsoil ranges in texture from fine sandy clay to fine sandy loam. The range in thickness of the subsoil is from 18 to 30 inches.

Woodstown fine sandy loam, nearly level phase, is strongly acid; the pH is about 5.3. The amount of calcium, magnesium, and phosphorus is low, and that of potassium is very low. In cultivated fields the soil contains about 1.7 percent organic matter. Internal drainage is medium to rapid; runoff is medium to slow. This soil is suitable for all crops commonly grown in the county. If this soil is used for tobacco, the nearly level areas should be drained by ditches. This soil is in capability unit IIw-1.

Woodstown fine sandy loam, gently sloping phase (2 to 5 percent slopes) (Wb).—This moderately well drained soil differs from the nearly level phase in slopes. Profile characteristics are the same for the two soils. Because of the stronger slopes and greater runoff, this soil is subject to erosion. Some areas of cultivated fields have lost up to 25 percent of the original surface soil. Cultivated areas need erosion control practices. Yields average about the same as from the nearly level phase. This soil

is of minor extent, but much of it is in cultivation. It is in capability unit IIe-2.

Woodstown loamy fine sand, nearly level thick surface phase (0 to 2 percent slopes) (Wc).—This soil has a coarser and thicker surface soil than Woodstown fine sandy loam, nearly level phase. Thickness of the surface soil ranges from 18 to 30 inches, compared with a range of 8 to 18 inches for the fine sandy loam, nearly level phase. The thick surface soil makes this soil somewhat droughty. Small concretions are present in the surface soil in some localities. Included with this soil are small areas having slopes up to 5 percent. Yields average less from this soil than from the two phases of Woodstown fine sandy loam.

Woodstown loamy fine sand, nearly level thick surface phase, is a fairly extensive soil, and a considerable part is in cultivation. It is in capability unit IIs-1.

Use and Management of Soils

In this section the soils of Duplin County are grouped into capability classes, subclasses, and units. The use and management of each capability unit is discussed. In addition, the estimated average yields of principal crops are given for each soil under two levels of management.

Capability Groups of Soils

Soils of Duplin County have been grouped in units within five capability classes and three subclasses. This is part of a nationwide system in which there are eight land capability classes, up to four subclasses, and units within each class and subclass that are groups of similar soils.

The eight general classes are based on the degree that natural features of each soil limit its use for crops, grazing, woodland, or wildlife. A soil is placed in one of the eight classes after study of the uses that can be made of it, the risks of erosion or other damage when it is used, and the need for practices to keep it suitable for use, to control erosion, and to maintain yields.

In classes I, II, and III are soils that are suitable for annual or periodic cultivation for annual or short-lived crops. Class I soils are those that have the widest range of use and the least risk of damage. They are level or nearly level, productive, well drained, and easy to work. They can be cultivated with almost no risk of erosion and will remain productive if managed with normal care.

Class II soils can be cultivated regularly, but they do not have quite so wide a range of suitability as class I soils, or they need more protection. Some class II soils are gently sloping and consequently need moderate care to prevent erosion; others may be slightly droughty or slightly wet, or somewhat limited in depth.

Class III soils can be cropped regularly but have a narrower range of use and need still more careful management.

In class IV are soils that should be cultivated only occasionally or only under very careful management.

In classes V, VI, and VII are soils that should not be cultivated but that can be used for pasture, for range, or for forest. Class V soils are level but are droughty, wet, low in fertility, or otherwise unsuitable for cultivation.

Class VI soils are not suitable for crops because they are steep or droughty or otherwise limited, but they give fair yields of forage or forest products. Some soils in class VI can, without damage, be cultivated enough so that fruit trees or forest trees can be set out or pasture plants seeded.

Class VII soils provide only poor to fair yields of forage or forest products.

In class VIII are soils that have practically no agricultural use. Classes V, VI, and VIII of the national system do not occur in Duplin County.

Capability subclasses.—The soils in any one capability class are limited to the same degree, but their use may be limited for different reasons. To show the main kind of limiting factor, any one of classes II through VIII may be divided into from one to four subclasses, each identified by a letter following the capability class number. The letter "e" indicates that the risk of erosion is the chief factor that limits the uses of the soil; the letter "w" is used if the soil is wet enough to limit its use; the letter "s" shows that the soil is shallow, droughty, or unusually low in fertility; and the letter "c" is used to indicate that the climate is so hazardous that it limits the uses of the soil.

The capability classes, subclasses, and units that occur in Duplin County are given in the following list. The description of each capability unit, the soils that are in it, and suggestions on how to use and manage those soils follow this list.

Class I.—Soils that are easy to farm and have no serious limitations for use.

Unit:

I-1: Nearly level, well-drained soils.

Class II.—Soils that have moderate limitations if cultivated.

Subclass IIe: Gently sloping soils subject to erosion if not protected:

Unit:

IIe-1: Gently sloping, well-drained soils.

IIe-2: Gently sloping, moderately well drained soils.

Subclass IIw: Soils moderately limited by wetness or easily drained for cropland use:

Unit:

IIw-1: Nearly level, moderately well drained soils.

IIw-2: Nearly level, somewhat poorly drained soils.

IIw-3: Nearly level, poorly drained soils with fine sandy clay loam or sandy clay subsoils.

Subclass IIs: Soils moderately limited in water-holding capacity:

Unit:

IIs-1: Nearly level and gently sloping well-drained sandy soils with thick surface soils.

Class III.—Soils that have severe limitations if cultivated.

Subclass IIIe: Sloping soils subject to erosion if not protected:

Unit:

IIIe-1: Sloping, well-drained soils.

IIIe-2: Sloping or gently sloping soils with slowly permeable subsoils.

Subclass IIIw: Somewhat poorly or poorly drained soils that can be improved by drainage:

Unit:

IIIw-1: Nearly level, somewhat poorly drained soils with thick sandy surface soils.

IIIw-2: Level, poorly drained and somewhat poorly drained soils with clay subsoils.

IIIw-3: Nearly level, poorly drained or somewhat poorly drained soils.

IIIw-4: Level, very poorly drained, black loamy soils.

Subclass IIIs: Very sandy soils suitable for some use as cropland:

Unit:

IIIs-1: Very sandy, level to sloping well drained or excessively drained soils.

Class IV.—Soils fairly well suited for limited or occasional cultivation under careful management.

Subclass IVe: Strongly sloping soils:

Unit:

IVe-1: Strongly sloping eroded or slowly permeable soils.

Subclass IVw: Poorly drained or wet soils:

Unit:

IVw-1: Very poorly drained black or dark-gray soils along streams and in low areas of uplands.

IVw-2: Deep sands, moderately well drained to poorly drained.

IVw-3: Poorly drained soils with dark-gray or black loam or silt loam surface soils. Subsoils are very slowly permeable plastic clay.

Subclass IVs: Coarse, somewhat excessively drained soils:

Unit:

IVs-1: Deep sandy soils, excessively drained.

Class VII.—Soils severely limited for use as pasture or woodland.

Unit:

VIIw-1: Swamp.

VIIs-1: Strongly sloping very sandy soils.

Management by capability units

The soils in one capability unit have about the same limitations and risks of damage. They will respond in a similar but not in an identical way to management. Soils in one unit therefore need about the same kind of management, although they may be somewhat different in characteristics and in appearance.

The soils of Duplin County are listed in 21 capability units. In the following pages, each capability unit is described, and the major problems, desirable management, and suitable crops for each are discussed.

Lime and fertilizer should be used on all cropland in the amounts indicated by soil tests and field trials. Crop residues should be conserved and kept on or near the surface. Cropping systems should be planned to maintain crop quality and yields and to aid in the control of diseases and insects.

Gently sloping land should be cultivated along the contour. Natural waterways in sloping cultivated fields should be maintained in sod and used to dispose of excess surface water.

Lime and fertilizer should be applied in adequate quantities when seeding grasses and legumes for hay or pasture. They should be added periodically to maintain a good sod. Supplemental irrigation is good insurance against drought for crops of high acre value.

Nearly all of Duplin County is well suited to forestry. Soils that are good for crops are also good for trees. Many cropped areas of soils in classes III and IV could be better used for forestry. Loblolly pine is suitable for most soils in the county except those that are under water for long periods. Slash pine and longleaf pine are also suited to many soils. The low areas on which water stands for extended periods support fairly good stands of pond pine and dense stands of hardwood trees. The potential value of trees should be considered before land is improved for cropping and cultivation.

Capability unit I-1.—Nearly level, well-drained soils. The surface soils are grayish-brown or light yellowish-brown fine sandy loams. The subsoils are yellowish-brown or reddish-brown sandy clay loams.

Soils in the unit are:

Kalmia fine sandy loam.
Marlboro fine sandy loam, nearly level phase.
Norfolk fine sandy loam, nearly level phase.
Ruston fine sandy loam, nearly level phase.

The surface soils are moderately thick and readily permeable. The thick well-drained subsoils are permeable to roots to depths of several feet. Soils in this unit are acid, and a large part of their plant nutrients has been lost through leaching.

The soils are particularly well suited to tobacco, corn, cotton, and soybeans. They are easy to work over a wide range of moisture conditions and require no special practices to control erosion. The subsoils have a fairly good capacity to supply moisture and store plant nutrients. Workability and permeability to water may be reduced by heavy cropping, but this tendency can be overcome if crop residues are retained and winter cover crops are grown. Lime and fertilizer in quantities determined by soil tests are needed for high yields of crops.

Suitable cropping systems are:

1. Tobacco, followed by a winter cover; the second year, cotton or corn, followed by a winter grain and fescue, which are both harvested the third year.
2. Soybeans; cotton; corn.
3. Tobacco, followed by a winter grain; second year, the grain harvested and weeds allowed to grow; third year, cotton or corn.

Capability unit II-1.—Gently sloping, well-drained soils with red to yellowish-brown sandy clay loam subsoils. The surface soils are thin to moderately thick and their texture is fine sandy loam. In some places all the surface soil is gone and the subsoil is exposed.

Soils in this unit are:

Magnolia fine sandy loam, eroded gently sloping phase.
Marlboro fine sandy loam, gently sloping phase.
Marlboro fine sandy loam, eroded gently sloping phase.
Norfolk fine sandy loam, gently sloping phase.
Norfolk fine sandy loam, eroded gently sloping phase.
Ruston fine sandy loam, gently sloping phase.
Ruston fine sandy loam, eroded gently sloping phase.

The surface soils are generally easily worked over a wide range of moisture conditions, but the eroded spots are more difficult to work. The subsoils are thick and well drained, and they supply more moisture and can store more plant nutrients than other soils in the county.

The soils of this unit are acid and have lost much of their plant nutrients through leaching. Because of the slopes, the soils are subject to damage from water erosion; the less permeable Marlboro and Magnolia soils are especially susceptible to damage.

Soils in this unit are well suited to tobacco, corn, and cotton. Runoff and erosion can be reduced and productivity maintained by applying lime and fertilizers and planting close-growing crops one-third to one-half the time in suitable cropping systems. Management should also include contour cultivation, terracing, and the use of well-sodded waterways. Workability, permeability, and the content of organic matter are reduced if these soils are continuously cropped. Lime and fertilizers are needed for high yields of crops in amounts that can be determined by testing the soil.

Suitable cropping systems are:

1. Tobacco, followed by winter grain and fescue; grain harvested the second year, and the fescue allowed to grow.
2. Cotton or corn, followed by winter grain seeded with fescue and lespedeza; second year, grain harvested and fescue and lespedeza allowed to grow; and the third year, fescue and lespedeza.
3. Tobacco, followed by winter grain; grain is harvested the second year and weeds are allowed to grow.

Capability unit II-2.—Gently sloping, moderately well drained soils with dark-gray or grayish-brown fine sandy loam surface soils. Subsoils are light olive-brown or yellowish-brown fine sandy clay loam, mottled in the lower part.

In this unit are:

Duplin fine sandy loam, gently sloping phase.
Goldshoro fine sandy loam, gently sloping phase.
Woodstown fine sandy loam, gently sloping phase.

The surface soils are easily worked, but cultivation must be delayed longer after rains than for soils in capability unit II-1. In addition, crops are damaged less in short periods of drought than on soils in capability unit II-1. The subsoils are fairly high in content of plant nutrients and in capacity to supply moisture, compared to the other soils in the county. The soils are acid and have lost their plant nutrients through leaching. Slopes range from 5 to 8 percent; consequently, the soils are subject to runoff and erosion.

Soils in this unit are well suited to tobacco and corn. Damage from erosion can be reduced and productivity of the soil maintained by the use of lime and fertilizers and by planting close-growing crops one-third to one-half the time in suitable cropping systems. Management should also include cultivation along the contour, terracing, and the use of sodded waterways. Soils used for tobacco can be improved by draining the low spots in fields. Continuous cropping reduces the permeability, workability, and the supply of organic matter. The physical properties can be maintained by using crop residues on the land and growing sod-forming crops in the cropping systems.

Suitable cropping systems are:

1. Tobacco, followed by winter grain and fescue; second year, harvest grain and allow fescue to grow.
2. Corn or cotton, followed by winter grain seeded with fescue and lespedeza; second year, harvest grain and grow fescue and lespedeza; third year, fescue and lespedeza.
3. Tobacco, followed by winter grain; second year, grain harvested and weeds allowed to grow.

Capability unit IIw-1.—Nearly level, moderately well drained soils with dark-gray or grayish-brown fine sandy

loam surface soils. In most places the subsoils are brownish-yellow to light olive-brown fine sandy clay loam, mottled in the lower part.

Soils in this unit are:

Craven fine sandy loam, nearly level phase.
Duplin fine sandy loam, nearly level phase.
Goldsboro fine sandy loam, nearly level phase.
Woodstown fine sandy loam, nearly level phase.

The surface soils are fairly thick and are permeable and easily worked. The capacity to store plant nutrients and to supply moisture is fairly high for these soils in comparison with other soils in the county. The soils of this unit are acid, and their plant nutrients have been lost through leaching.

Excessive moisture is a hazard in some fields during wet years. Such fields should be drained to obtain highest yields of crops. Tile or open ditches can be spaced at moderately wide intervals, except in the less permeable Craven soils, where narrower spacing is needed.

The soils are suited to corn, soybeans, wheat, and oats. They are excellent for tobacco if the wetter areas and low spots in fields are adequately drained. Workability and permeability of these soils are reduced by frequent cultivation. Soil structure can be maintained if crop residues are plowed under and winter cover crops are grown. The soils respond well to good management. Need for lime and fertilizer should be determined by soil tests.

Suitable cropping systems are:

1. Tobacco, followed by winter grain and fescue; second year, grain harvested and fescue allowed to grow as a green-manure crop for tobacco.
2. Tobacco, followed by winter cover; second year, cotton or corn, followed by winter grain and fescue; third year, grain harvested and fescue turned under for tobacco.
3. Truck crops, followed by winter cover; corn the second year; soybeans the third year.
4. Corn, followed by winter grain seeded with fescue and Ladino clover; allow fescue and clover to grow for 2 to 5 years.

Capability unit IIw-2.—Nearly level, somewhat poorly drained soils with dark-gray to brownish-gray fine sandy loam surface soils and moderately permeable clay loam subsoils, mottled with gray, yellow, and brown.

Soils in this unit are:

Dunbar fine sandy loam.
Izagora fine sandy loam.
Lynchburg fine sandy loam.
Stough fine sandy loam.

The surface soils are fairly thick, but they are easily worked and they absorb water readily. The subsoil has moderate to moderately slow permeability, and its capacity to store plant nutrients and supply moisture is fairly good.

These soils are strongly acid and moderately low in supply of plant nutrients. The content of organic matter is higher than in the well-drained soils, but the amount of lime needed is greater. Fertilizers and lime should be applied in amounts indicated by soil tests.

Excessive moisture is the major problem in the use of these soils. Before they can be farmed satisfactorily, the soils must be drained by use of open ditches or tile systems. If adequately drained, the soils of this unit are well suited to tobacco, corn, soybeans, wheat, oats, lespedeza, grasses, and clovers.

The infiltration rate and workability of these soils are

reduced by continuous cultivation. Soil structure, drainage, and aeration can be maintained or improved by retaining all crop residues on the land and by growing sod-forming and winter cover crops in suitable cropping systems. Large increases in yields can be obtained by good management.

Suitable cropping systems are:

1. Tobacco, followed by winter grain and fescue; grain harvested the second year.
2. Truck crops, followed by winter cover; corn the second year; and soybeans the third year.
3. Soybeans; second year, corn, followed by winter grain and lespedeza; third year, grain and lespedeza harvested.
4. Corn, followed by winter grain seeded with fescue and Ladino clover; allow fescue and clover to grow for 2 to 5 years.

Capability unit IIw-3.—Nearly level, poorly drained soils, with gray or dark-gray fine sandy loam surface soils and mottled fine sandy clay loam or sandy clay subsoils.

Soils in this unit are:

Rains fine sandy loam.
Coxville fine sandy loam, sandy clay subsoil phase.

The surface soils can be worked easily when they are drained. The infiltration rate of the surface soils is good, and the permeability of the subsoils is moderate to slow. The capacity of these soils to store plant nutrients and supply moisture is good.

These soils are strongly acid and moderately low in plant nutrients. Supplies of organic matter are considerably higher than in the well-drained soils; lime requirements are relatively greater. Fertilizers and lime should be applied for various crops according to soil tests.

The water table is high for long periods each year, and it prevents the use of these soils for crops or pasture. However, when adequately drained, the soils are well suited to corn, soybeans, truck crops, and forage crops. They are also used for tobacco and cotton, but they are not so well suited to these crops as soils that are naturally better drained. Where these soils are hard to drain because of their position, they should be used for pasture or hay rather than for cultivated crops. In their natural undrained condition, these soils are good for pine trees.

The surface soils tend to run together under continuous cultivation, and as a result the infiltration rate is reduced and tillage is more difficult. Soil structure can be maintained by keeping all crop residues on the soil and by growing cover crops and sod-forming crops in suitable cropping systems. Large increases in yields can be obtained by good management.

Open ditches or tiles spaced at moderately wide intervals can be used for drainage. The spacing on Rains soil can be somewhat wider than on the Coxville soil.

Suitable cropping systems are:

1. Soybeans or corn, followed by winter grain and lespedeza; second year, harvest the grain and lespedeza.
2. Corn or truck crops, followed by winter grain and lespedeza; second year, harvest the grain and lespedeza; third year, soybeans.
3. Cotton; truck crops the second year; and soybeans the third year.
4. Corn; soybeans the second year.

Capability unit IIs-1.—Nearly level and gently sloping well-drained sandy soils, chiefly loamy fine sands with thick surface soils and yellow, brown, or red fine sandy clay loam subsoils.

Soils in this unit are:

Goldsboro loamy fine sand, nearly level thick surface phase.
 Goldsboro loamy fine sand, gently sloping thick surface phase.
 Magnolia loamy fine sand, nearly level thick surface phase.
 Magnolia loamy fine sand, gently sloping thick surface phase.
 Norfolk loamy fine sand, nearly level thick surface phase.
 Norfolk loamy fine sand, gently sloping thick surface phase.
 Ruston loamy fine sand, nearly level thick surface phase.
 Ruston loamy fine sand, gently sloping thick surface phase.
 Woodstown loamy fine sand, nearly level thick surface phase.
 Kenansville fine sandy loam, nearly level phase.
 Kenansville fine sandy loam, gently sloping phase.

These soils are easy to work, have high infiltration rates, and warm early in spring. They are acid and low in supplies of plant nutrients and organic matter. Their capacity to store plant nutrients and supply moisture is fair.

Runoff and erosion are not serious problems, and special measures to control them are not needed on nearly level areas. However, gently sloping fields should be terraced and cultivated along the contour. Wind erosion causes damage when large fields are plowed in spring.

The soils are very well suited to tobacco and sweetpotatoes and fairly well suited to corn, cotton, soybeans, wheat, and oats. Coastal bermudagrass and bahiagrass are suitable crops for pasture and hay.

Cropping systems should include sod-forming crops from a third to half the time. Strips of crops across the direction of prevailing winds help prevent wind erosion. All plant residues should be returned to the soil. Crotalaria in the cropping system also helps supply the additional organic matter that these soils need for highest yields. Lime and fertilizer should be applied to various crops according to results of soil tests. The lime required by these soils is less than that required by soils of finer texture. Yields can be increased by good management.

Suitable cropping systems are:

1. Tobacco or cotton, followed by winter grain and crotalaria; second year, grain and crotalaria harvested; third year, corn, followed by winter grain and fescue; fourth year, grain and fescue harvested.
2. Sweetpotatoes, followed by winter grain; second year, harvest the grain and allow weeds to grow; third year, tobacco.
3. Tobacco, followed by crotalaria; second year, corn, followed by crotalaria; third year, cotton, followed by winter clover.

Capability unit IIIe-1.—Sloping, well-drained soils with yellowish-brown to red sandy clay loam subsoils. The surface soils are fine sandy loams. In places erosion has exposed the subsoil.

Soils in this unit are:

Magnolia fine sandy loam, eroded sloping phase.
 Norfolk fine sandy loam, sloping phase.
 Norfolk fine sandy loam, eroded sloping phase.
 Ruston fine sandy loam, eroded sloping phase.
 Ruston fine sandy loam, sloping phase.

These soils are subject to rapid runoff and serious erosion if cultivated. In some areas much of the surface soil has been lost through erosion. The soils are acid and low in supplies of plant nutrients. They are easily worked, but tillage is more difficult in the eroded areas. Their capacity to store plant nutrients and supply moisture is moderate.

The soils in this unit are suited to cotton, corn, and tobacco. However, sod-forming crops should be grown two-thirds of the time in all cropping systems to protect the soils against further damage from erosion. Most

forage crops are well suited. Coastal bermudagrass grows well.

Good management should also include terracing, cultivation along the contour, stripcropping, and the use of grassed waterways and terrace outlets. Lime and fertilizers are needed to produce good yields and should be applied in amounts indicated by soil tests.

Suitable cropping systems are:

1. Cotton or corn, followed by winter grain; second and third year, small grain and lespedeza.
2. Tobacco, followed by winter cover; second year, tobacco, followed by winter grain and lespedeza; third and fourth years, small grain and fescue.
3. Corn or cotton; second year, milo or corn, overseeded with Ladino clover and fescue or lespedeza in spring, and small grain seeded in fall; third year, harvest grain; fourth year, fescue and lespedeza or clover.

Capability unit IIIe-2.—Sloping and gently sloping soils with slowly permeable yellow or brown fine sandy clay or clay subsoils. The surface soils are fine sandy loams. In some spots erosion has exposed the subsoil.

Soils in this unit are:

Caroline fine sandy loam, gently sloping phase.
 Caroline fine sandy loam, eroded gently sloping phase.
 Caroline fine sandy loam, sloping phase.
 Caroline fine sandy loam, eroded sloping phase.
 Craven fine sandy loam, gently sloping phase.
 Craven fine sandy loam, eroded gently sloping phase.
 Craven fine sandy loam, eroded sloping phase.

Slowly permeable subsoils and strong slopes cause serious runoff and erosion problems. Severely eroded areas are difficult to till. The soils of this unit have a moderate capacity to store plant nutrients and supply moisture. They are strongly acid and moderately low in supplies of plant nutrients.

Soils in this unit are fairly well suited to cotton, corn, and tobacco. However, sod-forming crops should be grown two-thirds of the time to help control erosion. Forage crops are fairly well suited to the soils. Areas that are rough and irregular are best suited to pasture or hay.

Management should also include terracing, cultivation along the contour, stripcropping, and the use of well-protected waterways and terrace outlets. Lime and fertilizers should be applied to various crops according to the results of soil tests. Increases in yields can be obtained by good management.

Suitable cropping systems are:

1. Tobacco, followed by winter grain and fescue; second year, harvest grain; third and fourth years, fescue.
2. Corn, followed by small grain seeded with fescue and Ladino clover; second year, harvest grain; third and fourth years, Ladino clover and fescue.
3. Cotton or corn; second year, milo or soybeans, followed by winter grain seeded with fescue and Ladino clover or lespedeza; third year, harvest grain; fourth year, fescue and legume.

Capability unit IIIw-1.—Nearly level, somewhat poorly drained soils with thick dark-gray or grayish-brown sandy surface soils and mottled sandy clay loam subsoils. In many places there is a layer of sand under the subsoil at depths ranging from 30 to 42 inches.

Soils in this unit are:

Dragston fine sandy loam.
 Dragston loamy fine sand, thick surface phase.
 Lynchburg loamy fine sand, thick surface phase.

The water table is usually high in these soils some time during the year. As a rule the soils cannot be cultivated

unless they are drained. They are easy to work, and their capacity to store plant nutrients is moderately good. They are strongly acid and low in supplies of plant nutrients.

Since the subsoils and the underlying layer of sand are permeable and relatively easy to drain, widely spaced open ditches or tile systems can be used. However, the sides of ditches that are cut too deeply into the layer of sand cave in, and the cost of maintaining the system is therefore increased.

If adequately drained, the soils are suited to corn, soybeans, truck crops, small grains, tobacco, cotton, and forage crops. Yields increase under proper management. Lime and fertilizers should be applied to various crops according to the results of soil tests. Dragston fine sandy loam responds especially well to management because it has greater capacity to store plant nutrients and supply moisture than the other soils in this capability unit.

For adequately drained soils suitable cropping systems are:

1. Corn, followed by winter grain; second and third years, small grain and lespedeza.
2. Corn, followed by winter grain and lespedeza; second year, harvest grain and lespedeza; third year, soybeans, followed by winter grain and lespedeza; fourth year, harvest grain and lespedeza.
3. Tobacco or truck crops; second year, corn or cotton, followed by winter grain and fescue; third year, harvest grain and turn under the fescue for the next row crop.

Capability unit IIIw-2.—Level, poorly drained and somewhat poorly drained soils with dark-gray fine sandy loam surface layers and gray or mottled plastic clay subsoils.

Soils in this unit are:

Bladen fine sandy loam.
Coxville fine sandy loam.
Lenoir fine sandy loam.

Water tables in these soils are high, and the subsoils are slowly permeable. The soils are strongly acid. They have a high capacity to store plant nutrients and a moderate capacity to supply moisture. Supplies of organic matter are fairly high, and those of plant nutrients are moderate.

Soils in this unit are not suitable for crops or pasture unless they are drained. As a rule good drainage can be obtained by use of open ditches. Tile must be closely spaced because of the slowly permeable subsoils.

If adequately drained, the soils are suited to corn, soybeans, small grains, and forage and truck crops. Large increases in yields can be obtained by good management. Lime and fertilizers are needed in amounts indicated by soil tests. These soils need larger quantities of lime than the coarser soils containing less organic matter.

For adequately drained soils suitable cropping systems are:

1. Corn; second year, soybeans, followed by winter grain and fescue seeded with Ladino clover; third year, harvest grain; fourth year, fescue and Ladino clover.
2. Corn; second year, soybeans, followed by winter grain and lespedeza; third year, harvest grain and lespedeza.
3. Corn, followed by winter cover; second year, corn, followed by winter grain and lespedeza; third year, harvest grain and lespedeza.
4. Corn, followed by winter cover; second year, soybeans.

Capability unit IIIw-3.—Nearly level, poorly drained or somewhat poorly drained soils with thick sandy surface soils, mostly loamy fine sand. Subsoils are loamy fine

sand, fine sandy loam, or fine sandy clay loam. Colors are shades of gray with some mottling in the subsoils.

Soils in this unit are:

Fallsington fine sandy loam.
Klej loamy fine sand.
Myatt fine sandy loam.
Myatt loamy fine sand.
Ona loamy fine sand.
Plummer loamy fine sand.
Rains loamy fine sand, thick surface phase.
Stough loamy fine sand, thick surface phase.

The water table is high in these soils for extended periods each year. All soils, except some areas of Klej and Ona, need drainage for cultivation. All are strongly acid and low in supplies of plant nutrients. Their capacity to store plant nutrients and supply moisture is low to moderate.

The subsoils can be drained readily by widely spaced tiles or open ditches. Installation and maintenance of drainage systems are expensive in areas of wet sandy subsoils or where a layer of sand underlies the finer textured subsoils. Ditches should be dug when the water table is low to prevent caving of the sides.

If adequately drained, the soils are suitable for corn, small grains, soybeans, truck crops, Coastal bermuda-grass, dallisgrass, fescue, and lespedeza. The most suitable use in many areas is pasture. Increases in yields of crops are moderate to high under good management. Soils should be tested to determine the needs of various crops for lime and fertilizers.

The following cropping systems are suitable if the soils are drained:

1. Corn, followed by winter grain; second and third years, small grain and lespedeza.
2. Corn, followed by winter grain and lespedeza; second year, harvest grain and lespedeza; third year, soybeans, followed by winter grain and lespedeza; fourth year, harvest grain and lespedeza.
3. Tobacco or truck crops; second year, corn or cotton, followed by winter grain and fescue; third year, harvest grain, and turn under the fescue for the next row crop.

Capability unit IIIw-4.—Level, very poorly drained black loamy soils with gray or mottled sandy clay loam subsoils.

Soils in this unit are:

Okenee fine sandy loam.
Okenee loam.
Pocomoke loam.
Portsmouth loam.
Portsmouth mucky loam.

These soils occupy low positions on the landscape, and the water table is near the surface most of the time. Artificial drainage is necessary if they are used for cultivation or for forage crops. If suitable outlets can be located, either tile or open-ditch systems can be used for draining these soils. A layer of sand at depths of about 36 inches in many places under the Pocomoke and Okenee soils tends to flow into ditches and thus make the installation and maintenance of drainage systems expensive. Only small areas of the soils in this unit have been improved for cultivation in Duplin County.

The soils are strongly acid. Supplies of organic matter are high; those of plant nutrients are medium to low. The capacity to store plant nutrients and to supply moisture is moderate to high.

If adequately drained, the soils are well suited to corn, soybeans, small grain, Ladino clover, lespedeza, fescue,

and dallisgrass. High increases in crop yields can be obtained through good management. Lime and fertilizers for the various crops should be applied in amounts indicated by soil tests.

The following cropping systems are suitable on adequately drained soils:

1. Corn, followed by winter grain seeded with fescue and Ladino clover; second year, harvest grain; third and fourth years, clover and fescue.
2. Corn, followed by winter grain and Ladino clover; harvest grain second year, and allow clover to grow the third year.
3. Corn, followed by winter grain and lespedeza; second year, harvest grain and lespedeza; third year, soybeans.
4. Corn; second year, soybeans.

Capability unit IIIs-1.—Very sandy, level to sloping, well drained or excessively drained soils.

Soils in this unit are:

Caroline-Lakeland complex, gently sloping phases.
 Caroline-Lakeland complex, sloping phases.
 Eustis loamy fine sand, nearly level phase.
 Eustis loamy fine sand, gently sloping phase.
 Kenansville loamy fine sand, nearly level thick surface phase.
 Kenansville loamy fine sand, gently sloping thick surface phase.
 Lakeland loamy fine sand, nearly level phase.
 Lakeland loamy fine sand, gently sloping phase.
 Lakeland fine sand, nearly level shallow phase.
 Lakeland fine sand, gently sloping shallow phase.
 Norfolk loamy fine sand, sloping thick surface phase.
 Ruston loamy fine sand, sloping thick surface phase.

These soils are acid, very permeable, and leached of their plant nutrients. Supplies of organic matter are very low. The soils are easily worked. Their capacity to retain moisture and plant nutrients is low.

These soils are not ordinarily damaged by runoff and water erosion. However, they are highly subject to wind erosion in spring when large areas of bare soil are exposed.

Yields of corn, cotton, tobacco, and small grains are good in years of adequate rainfall. In years of drought crops are damaged more on these soils than on those having a higher moisture-supplying capacity. Coastal bermudagrass and lespedeza grow well on these soils, but other forage crops are not well suited. Crotalaria is good for supplying organic matter to the soils.

Management should include the use of close-growing crops in cropping systems, the planting of crops in strips crosswise to the prevailing winds, and maintaining crop residues on or near the surface. Tree-and-shrub windbreaks also protect soil and young crops from wind damage. The soils respond quickly to additions of lime and fertilizer. These elements should be applied in amounts indicated by soil tests. These soils need less lime than soils of finer texture.

Suitable cropping systems are:

1. Tobacco, followed by winter grain and crotalaria; second year, harvest grain and turn under crotalaria; third year corn or cotton, followed by winter grain and crotalaria.
2. Corn, cotton, or tobacco, followed by winter grain and crotalaria.
3. Corn, followed by winter cover; second year, tobacco, followed by winter grain and crotalaria; third year, winter grain and crotalaria.

Capability unit IVE-1.—Strongly sloping, eroded or slowly permeable soils, with reddish-brown sandy clay or sandy clay loam subsoils. Where not eroded, the surface soil is gray or grayish-brown fine sandy loam.

Soils in this unit are:

Caroline fine sandy loam, strongly sloping phase.
 Ruston fine sandy loam, eroded strongly sloping phase.

Runoff and erosion are serious problems if these soils are cultivated. Many areas have been moderately to severely eroded, and the subsoil is exposed. Such areas are difficult to work; but where the surface soils are sandy, tillage is easy.

The soils are strongly acid and low in supplies of plant nutrients. Their capacity for storing plant nutrients and supplying moisture is moderate.

The soils are suited to corn, cotton, tobacco, small grains, fescue, Coastal bermudagrass, and lespedeza. In many areas pasture is the best use for these soils. Cultivation should be along the contour, and cropping systems should include close-growing vegetation most of the time to protect the soils against erosion. Depressions should be left in sod.

Fair to good increases in crop yields can be obtained by good management. Lime and fertilizers should be applied to various crops in amounts indicated by soil tests.

Suitable cropping systems are:

1. Tobacco, followed by winter grain and fescue; second year, harvest grain; third and fourth years, fescue.
2. Corn or cotton, followed by sericea lespedeza for an additional 4 years.

Capability unit IVw-1.—Very poorly drained black or dark-gray soils along streams and in low areas of uplands. For the most part they consist of organic materials or of sands high in organic matter.

Soils in this unit are:

Johnston loam.
 Mixed local alluvial land.
 Mixed alluvial land, poorly drained.
 Pamlico muck.
 Pamlico muck, shallow phase.
 Rutlege loam.
 Rutlege loam, thick surface phase.
 Rutlege loamy fine sand.
 Rutlege mucky loam, thick surface phase.
 St. Johns loamy fine sand.

These soils are strongly acid and low in content of plant nutrients. Johnston loam and Pamlico muck have a high capacity to retain plant food.

The soils of this unit must be drained and protected from flooding before they can be used for cultivation or pasture. In many places proper outlets are not available, and ditches dug in sand are difficult and expensive to maintain because of caving banks. A system of diking and pumping may have to be used for draining these soils.

If drained, fertilized, and protected from flooding, these soils are suited to corn, soybeans, small grains, fescue, Ladino clover, and lespedeza. Fertilizers should be added to crops in amounts indicated by soil tests.

Suitable cropping systems are:

1. Corn, followed by small grain seeded with fescue; second year, small grain and fescue seeded with Ladino clover; third and fourth years, fescue and Ladino clover.
2. Corn; second year, soybeans, followed by small grain; third year, small grain and lespedeza.
3. Corn; second year, soybeans.

Capability unit IVw-2.—Deep sands, moderately well drained to poorly drained. Colors may be nearly white, gray, or dark gray.

Soils in this unit are:

Immokalee fine sand.
 Klej fine sand.
 Klej fine sand, terrace phase.
 Leon fine sand.

Ona fine sand.
Plummer fine sand.
Plummer fine sand, terrace phase.

The soils of this unit are very permeable, strongly acid, and very low in content of plant nutrients. Their capacity to supply moisture and retain plant nutrients is very low. The root zone in Leon and Immokalee soils is limited by a cemented sand hardpan.

Most areas of the soils in this management group require drainage for cultivation, although the naturally better drained areas can be cultivated without it. Drainage systems are expensive to install and maintain because of flowing sand.

If drained and adequately fertilized and limed, the soils produce good yields of corn, soybeans, and small grains. Forage crops are not well suited, but lespedeza, dallisgrass, and fescue grow fairly well. The soils should be tested to determine the correct amounts of lime and fertilizer for various crops.

Suitable cropping systems are:

1. Corn; second year, soybeans, followed by winter grain and fescue; third year, harvest grain and seed lespedeza in fescue; fourth year, fescue and lespedeza.
2. Corn, followed by winter grain and fescue; second year, harvest grain and seed lespedeza in fescue; third year, fescue and lespedeza.
3. Corn; second year, soybeans, followed by winter grain and lespedeza; third year, harvest grain and lespedeza.

Capability unit IVw-3.—Poorly drained soils with dark-gray or black loam or silt loam surface soils. The subsoil is gray or mottled, very slowly permeable plastic clay.

Soils in this unit are:

Bayboro loam.
Bladen silt loam.

The soils of this unit are strongly acid and have moderate supplies of plant nutrients. Their capacity to retain plant nutrients is high.

The water table in these soils is near the surface for long periods each year. Consequently, the soils cannot be cultivated or used for pasture until they are artificially drained. Open ditches are used to drain excessive surface water. Tile is seldom used because of the very slow permeability of the subsoils.

If adequately drained, limed, and fertilized, the soils are good for corn, soybeans, fescue, lespedeza, dallisgrass, and Ladino clover. Pasture is the best use in many areas because cultivation and the harvest of crops are difficult in rainy seasons. The soils should be tested to determine the proper amounts of lime and fertilizer needed.

Suitable cropping systems are:

1. Corn; second year soybeans, followed by winter grain and fescue; third year, harvest grain and seed Ladino clover in fescue; fourth year, fescue and Ladino clover.
2. Corn, followed by winter grain and fescue; second year, harvest grain and seed Ladino clover in fescue; allow clover and fescue to grow the third and fourth years.
3. Corn followed by winter grain and fescue; second year, harvest grain and seed lespedeza in fescue; third year, soybeans followed by winter cover.

Capability unit IVs-1.—Deep sandy soils, excessively drained.

Soils in this unit are:

Galestown fine sand, nearly level phase.
Galestown fine sand, gently sloping phase.
Lakeland fine sand, nearly level phase.

Lakeland fine sand, gently sloping phase.
Lakeland fine sand, sloping phase.
Lakeland fine sand, terrace phase.
Lakeland fine sand, sloping shallow phase.
Ruston loamy fine sand, strongly sloping thick surface phase.

These loose, coarse-textured soils are very permeable and highly leached. They are acid, low in content of organic matter, and very low in plant nutrients. Runoff and water erosion are not serious problems, but wind erosion and damage to young plants by moving particles of sand are hazards. The capacity of these soils to retain plant nutrients and supply moisture is very low.

In years of adequate rainfall, fairly good yields of cotton, corn, tobacco, and small grains can be obtained if fertilizers and organic matter are added to the soil. As a rule forage crops are not suited to these soils, but Coastal bermudagrass and lespedeza grow fairly well if adequately fertilized. Crotalaria is an excellent source of additional soil organic matter.

Management should include cultivation along the contour, and the planting of close-growing vegetation in strips at right angles to the prevailing winds to help prevent wind erosion. Tree-and-shrub windbreaks provide additional protection from erosive winds. Lime and fertilizers should be applied to various crops according to results of soil tests.

Suitable cropping systems are:

1. Corn or cotton, followed by winter cover; and the next 4 years, sericca lespedeza.
2. Corn or cotton, followed by winter grain; crotalaria for the next 2 years.
3. Corn, followed by crotalaria; second year, tobacco, followed by crotalaria; third and fourth years, small grain and crotalaria.

Capability unit VIIw-1.—Swamp. Because of the severe and prolonged flooding, none of this unit has been improved for agriculture. Swamp is covered by dense forest of gum and cypress.

Capability unit VIIs-1.—Strongly sloping very sandy soils. These soils are subject to the hazards of severe drought because of strong slopes, coarse texture, and excessive drainage.

Soils in this unit are:

Caroline-Lakeland complex, strongly sloping phases.
Lakeland fine sand, strongly sloping phase.

These soils are not suitable for crops or pasture. Forestry is the best use, although the quality of sites for tree growth is not high.

Estimated Yields

The estimated average acre yields that can be expected from the principal crops grown on soils of Duplin County under two levels of management are given in table 6. Yields in columns A were obtained under prevailing or ordinary management. Under such management not enough lime and fertilizer are used to produce maximum yields, definite cropping systems are not generally followed, and erosion control and drainage are usually inadequate. Improved varieties of crops and certified seed are not always used.

Yields in columns B were obtained by some farmers or by the Coastal Plain Vegetable Research Station at Faison under good management. Under this level of manage-

ment, enough lime and fertilizer are applied, and improved varieties, certified seed, and suitable cropping systems are used. In addition, adequate measures are taken to provide proper drainage and control erosion.

Morphology, Genesis, and Classification of Soils

Factors of Soil Formation

Soil is the product of soil-forming processes acting on parent material deposited or accumulated by geologic agencies. The characteristics of the soil depend upon the combination of five major factors: (1) The physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and existed; (3) the plant and animal life; (4) the relief; or lay of the land; and (5) the length of time these forces have acted on the material (11).

Parent material

The parent materials for soils of Duplin County are of two closely related kinds: (1) Interbedded and unconsolidated sands, silts, and clays comprising marine sediments in the uplands; (2) materials washed from these formations, transported by water or gravity, and laid down as alluvial deposits in the valleys. The geological materials for soils of both the uplands and valleys therefore originate in the marine sediments of the Coastal Plain formations.

The parent materials in the county differ in mineral and chemical composition and in their physical constitution. Major differences, such as those between sand, silt, and clay, can be observed in the field. Minor differences, as for example in mineralogical composition, may also be important to soil formation, but these can be determined only by careful laboratory examination. The nature of the sediments, both chemically and mineralogically, has not been studied sufficiently to determine how such composition relates specifically to differences among the soils. It is true, however, that many differences among soils of the county reflect original differences in the nature of the geological materials. Thus, parent material has been an important factor that has caused differences among soils of the county.

Climate

The climate of the county is of the humid, warm-temperate type. Long hot summers, short mild winters, and abundant rainfall are the main features. This relatively mild and moist climate favors rapid decomposition of minerals. Because of the high rainfall, soluble materials such as bases are completely leached from the soil and less soluble substances, including fine clay, are carried to deeper soil horizons. The soil is rarely frozen. Thus, mineral decay, leaching of soluble substances, and translocation of clay and sesquioxides can go forward all of the time. Under such climatic conditions, Red-Yellow Podzolic soils are commonly formed from parent materials that are moderately siliceous. The formation of such soils also requires good drainage and considerable time.

Temperature and precipitation are nearly uniform over the county. Weather stations in and near the county report less than 2 degrees variation in the average annual temperature and less than 3 inches variation in the average annual rainfall. Thus, variations in climate are very small and do not seem to have been the cause of local differences among soils. All of the soils in the county do show the effects of climate in being acid, strongly leached, and well weathered.

Plant and animal life

Higher plants, micro-organisms, earthworms, insects, and other forms of life live on and in the soil and influence the direction and rate of soil genesis. Plants and animals largely determine the kinds of organic matter added to the soil and the way in which it is incorporated with the soil. They transfer nutrient elements from one horizon to another; they may also shift soil materials from one horizon to another. Gains and losses in organic matter, nitrogen, and plant nutrients and the changes in porosity and structure may be due to activities of plants and animals. Although these general effects are well known, the specific influences of the various species or groups of related species in the formation of any one soil are not. More is known about the relation of vegetation than about the relation of micro-organisms and larger animals to soil genesis.

Forests of pine and deciduous trees originally covered the well-drained uplands. The wet areas and stream terraces were covered mostly by pine and gum forests. Cypress and juniper grew in the upland swamps. The undergrowth in most places was bayberry and other water-tolerant bushes. The predominant understory on the upland consisted of myrtle and related shrubs. Vegetative differences probably were due to variations in drainage and in soils.

Many of the trees and shrubs important in soil development were moderately deep feeders and shed their leaves annually. Leaves contain various plant nutrients but, in general, the quantity of bases and phosphorus contained in leaves of deciduous trees is high compared with the quantity in leaves of coniferous trees. Fallen leaves transfer essential plant nutrients from the lower to the upper part of the soil and thus partly replace those lost through percolation. The transfer of plant nutrients is probably greater in drier or better drained soils than in more poorly drained soils.

Decaying leaves, twigs, roots, and whole plants add much organic matter to the upper part of the soil, where they are acted on by micro-organisms, earthworms, and other forms of life, and by direct chemical reactions. Organic material decomposes more rapidly in the better drained soils than in the more poorly drained soils. As a result, the more poorly drained soils have a higher content of organic matter. The decomposition of organic material releases organic acids. The acids increase the rate of solution of slowly soluble soil components and the rate of leaching and translocation of inorganic materials. The effect of organic acids on soil formation is conditioned by climate, which in turn modifies the rate of chemical reaction and of leaching and, to a large degree, determines the kinds of plants and animals in and on the soil.

TABLE 6.—*Estimated average*

[Yields in columns A are those to be expected over a period of years under ordinary management practices;

Soil	Land-capability unit	Snapbeans		Field corn		Sweet corn		Cotton		Cucumbers		Hay ¹	
		A	B	A	B	A	B	A	B	A	B	A	B
		Bu.	Bu.	Bu.	Bu.	Dozen ears	Dozen ears	Lb.	Lb.	Bu.	Bu.	Tons	Tons
Bayboro loam	IVw-3			40	100								
Bladen silt loam	IVw-3	140	180	30	80	700	1, 100			120	160	0. 8	2. 0
Bladen fine sandy loam	IIIw-2	150	200	35	90	800	1, 200			130	180	. 8	1. 8
Caroline fine sandy loam:													
Gently sloping phase	IIIc-2			25	60			250	500			. 7	2. 0
Eroded gently sloping phase	IIIc-2			20	45			200	400			. 6	1. 7
Sloping phase	IIIc-2			25	60			250	500			. 7	2. 0
Eroded sloping phase	IIIc-2			20	45			200	400			. 6	1. 7
Strongly sloping phase	IVe-1			25	60			250	500			. 7	2. 0
Caroline-Lakeland complex:													
Gently sloping phases	IIIs-1			10	40							. 3	1. 2
Sloping phases	IIIs-1			10	40							. 3	1. 2
Strongly sloping phases	VIIs-1			10	40							. 3	1. 2
Coxville fine sandy loam	IIIw-2	150	200	35	90	800	1, 200			130	180	. 8	1. 8
Coxville fine sandy loam, sandy clay subsoil phase	IIw-3	130	190	35	100	800	1, 300			120	160	1. 0	2. 0
Craven fine sandy loam:													
Nearly level phase	IIw-1	100	160	25	60	500	1, 000	250	600	80	130	. 8	1. 3
Gently sloping phase	IIIe-2	100	160	25	60	500	1, 000	250	600	80	130	. 8	1. 3
Eroded gently sloping phase	IIIe-2			20	45			150	500			. 4	1. 0
Eroded sloping phase	IIIe-2			20	45			150	500			. 4	1. 0
Dragston fine sandy loam	IIIw-1	120	180	35	80	800	1, 200	300	500	90	140	. 9	2. 0
Dragston loamy fine sand, thick surface phase	IIIw-1			30	40	460	900	200	400	70	100	. 7	1. 6
Dunbar fine sandy loam	IIw-2	130	190	35	100	800	1, 300	300	700	100	150	1. 0	2. 0
Duplin fine sandy loam:													
Nearly level phase	IIw-1	130	180	35	90	800	1, 200	300	750			1. 0	2. 0
Gently sloping phase	IIe-2	130	180	35	90	800	1, 200	300	750			1. 0	2. 0
Eustis loamy fine sand:													
Nearly level phase	IIIs-1			15	50	400	800	175	350			. 5	---
Gently sloping phase	IIIs-1			15	50	400	800	175	350			. 5	---
Fallston fine sandy loam	IIIw-3	120	180	30	70	700	1, 200			100	150	1. 0	2. 0
Galestown fine sand:													
Nearly level phase	IVs-1			15	45							. 5	---
Gently sloping phase	IVs-1			15	45							. 5	---
Goldsboro fine sandy loam:													
Nearly level phase	IIw-1	110	150	35	80	800	1, 200	300	700			. 7	1. 8
Gently sloping phase	IIe-2	110	150	35	80	800	1, 200	300	700			. 7	1. 8
Goldsboro loamy fine sand:													
Nearly level thick surface phase	IIIs-1			28	60			200	500			. 6	1. 4
Gently sloping thick surface phase	IIIs-1			28	60			200	500			. 6	1. 4
Immokalee fine sand	IVw-2			10				100					
Izagora fine sandy loam	IIw-2			20	60							. 8	1. 5
Johnston loam	IVw-1			30	80								
Kalmia fine sandy loam	I-1			25	90	800	1, 200	250	600			. 6	1. 8
Kenansville fine sandy loam:													
Nearly level phase	IIIs-1			20	60	700	1, 000	250	600			. 6	1. 8
Gently sloping phase	IIIs-1			20	60	700	1, 000	250	600			. 6	1. 8
Kenansville loamy fine sand:													
Nearly level thick surface phase	IIIs-1			15	50			200	500			. 4	1. 5
Gently sloping thick surface phase	IIIs-1			15	50			200	500			. 4	1. 5
Klej fine sand	IVw-2			15	20							. 4	1. 0
Klej fine sand, terrace phase	IVw-2			15	20							. 4	1. 0
Klej loamy fine sand	IIIw-3			18	60					60	90	. 5	1. 3
Lakeland fine sand:													
Nearly level phase	IVs-1			12	40			100	300			. 3	. 7
Gently sloping phase	IVs-1			12	40			100	300			. 3	. 7
Sloping phase	IVs-1			12	40			100	300			. 3	. 7
Strongly sloping phase	VIIs-1			12	40			100	300			. 3	. 7
Nearly level shallow phase	IIIs-1			18	60			200	500			. 7	1. 3
Gently sloping shallow phase	IIIs-1			18	60			200	500			. 7	1. 3
Sloping shallow phase	IVs-1			18	60			200	500			. 7	1. 3
Terrace phase	IVs-1			12	40			100	300			. 3	. 7
Lakeland loamy fine sand:													
Nearly level phase	IIIs-1			15	50			150	400			. 5	1. 0
Gently sloping phase	IIIs-1			15	50			150	400			. 5	1. 0
Lenoir fine sandy loam	IIIw-2			30	70							. 8	1. 8
Leon fine sand	IVw-2			8									
Lynchburg fine sandy loam	IIw-2	130	200	35	90	800	1, 200	200	600	100	150	1. 0	2. 0
Lynchburg loamy fine sand, thick surface phase	IIIw-1			28	75	700	1, 000	220	500	80	120	. 8	1. 8

See footnotes at end of table.

acre yields of principal crops

those in columns B, under good management practices. Absence of yield indicates crop is seldom, if ever, grown]

Permanent pasture		Sweet peppers		Potatoes		Sweet-potatoes		Oats		Wheat		Soybeans		Strawberries		Tobacco	
A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
<i>Cow-acre-days</i> ¹	<i>Cow-acre-days</i> ²	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>24-qt. crates</i>	<i>24-qt. crates</i>	<i>Lb.</i>	<i>Lb.</i>
150	250																
200	330							50	90			15	30				
180	300							40	80			15	28				
160	240							40	80	15	30	10	20			1,200	2,000
130	200							50	90	10	30	6	15			900	1,600
160	240							40	80	15	30	10	20			1,200	2,000
130	200							40	80	10	30	6	15			900	1,600
160	240							35	70	15	30	10	20			1,200	2,000
³ 120	³ 200					80	150									800	1,400
120	200					80	150									800	1,400
120	200					80	150									800	1,400
180	300							40	80			15	28				
200	300	130	200	150	300			40	80			10	18	100	150	1,200	
170	250	100	120	120	250	100	170			14	30	12	20	150	200	1,400	2,000
170	250	100	120	120	250	100	170			14	30	12	20	150	200	1,400	2,000
140	220			100						20	40	7				1,000	
140	220			100						20	40	7				1,000	
200	300	120	190	140	280			40	75			11	24	110	180	1,200	1,800
³ 150	³ 270	80	160					30	60			9	20	90	150	1,000	1,600
200	300	130	200	150	300			40	80	15	30	12	26	120	200	1,400	2,000
190	280	120	180	130	260	110	180	40	80	15	30	10	24	120	200	1,400	2,200
190	280	120	180	130	260	110	180	40	80	15	30	10	24	120	200	1,400	2,200
130						60	100					8				800	1,600
130						60	100					8				800	1,600
190	280	130	180	160	250			40	70			10	18	100	150	1,200	
120												8				800	1,400
120												8				800	1,400
150	260					100	170	15	30	15	30	10	22	120	180	1,300	2,200
150	260					100	170	15	30	15	30	10	22	120	180	1,300	2,200
³ 130	³ 220					90	150	40	80	15	30	8	18			1,000	1,800
³ 130	³ 220					90	150	40	80	15	30	8	18			1,000	1,800
50												6					
100	250											8	16				
130	250																
140	250			120	200	140	280			12	30	10	20			1,300	2,000
³ 130	³ 260			120	200	140	260					8	18			1,100	1,800
³ 130	³ 260			120	200	140	260					8	18			1,100	1,800
³ 120	³ 220					100	180					6	14			900	1,400
³ 120	³ 220					100	180					6	14			900	1,400
³ 60												6	10				
³ 60												6	10				
³ 80	³ 160											8	14			900	1,400
60						40	70					5	9			700	1,200
60						40	70					5	9			700	1,200
60						40	70					5	9			700	1,200
60						40	70					5	9			700	1,200
³ 80	³ 150					80	140			10	30	9	14	100	160	1,100	1,800
³ 80	³ 150					80	140			10	30	9	14	100	160	1,100	1,800
³ 80	³ 150					80	140			10	30	9	14	100	160	1,100	1,800
³ 60						40	70					5	9			700	1,200
³ 70						60	100					7	12			850	1,400
³ 70						60	100					7	12			850	1,400
100	250							40	80	15	40	10	24	120	200		
60																	
180	280	120	180	140	280			40	80	12	25	10	24	120	200	1,400	2,000
³ 150	³ 250	90	130	120	240			30	60			7	16	100	180	1,200	1,800

TABLE 6.—Estimated average acre yields

Soil	Land-capability unit	Snapbeans		Field corn		Sweet corn		Cotton		Cucumbers		Hay ¹	
		A	B	A	B	A	B	A	B	A	B	A	B
		Bu.	Bu.	Bu.	Bu.	Dozen ears	Dozen ears	Lb.	Lb.	Bu.	Bu.	Tons	Tons
Magnolia loamy fine sand:													
Nearly level thick surface phase.....	IIIs-1			25	75	800	1,000	340	700			0.8	1.8
Gently sloping thick surface phase.....	IIIs-1			25	75	800	1,000	340	700			.8	1.8
Magnolia fine sandy loam:													
Eroded gently sloping phase.....	IIe-1			30	100	800	1,000	350	750			.8	2.0
Eroded sloping phase.....	IIIe-1			30	100	800	1,000	350	750			.8	2.0
Marlboro fine sandy loam:													
Nearly level phase.....	I-1	130	200	35	110	900	1,300	380	800			.8	2.0
Gently sloping phase.....	IIe-1	130	200	35	110	900	1,300	380	800			.8	2.0
Eroded gently sloping phase.....	IIe-1			30	100	800	1,000	350	750			.8	1.8
Mixed alluvial land, poorly drained.....	IVw-1			15	60							1.0	2.0
Mixed local alluvial land.....	IVw-1			35	80					100	150	1.0	2.0
Myatt fine sandy loam.....	IIIw-3			30	70							1.0	2.0
Myatt loamy fine sand.....	IIIw-3			20	80							.7	1.7
Norfolk fine sandy loam:													
Nearly level phase.....	I-1	110	180	35	100	800	1,200	300	700			.7	2.0
Gently sloping phase.....	IIe-1	110	180	35	100	800	1,200	300	700			.7	2.0
Eroded gently sloping phase.....	IIe-1	90	160	30	90	750	1,100	250	700			.6	2.0
Sloping phase.....	IIIe-1	110	180	35	100	800	1,200	300	700			.7	2.0
Eroded sloping phase.....	IIIe-1	90	160	30	90	750	1,100	250	700			.6	2.0
Norfolk loamy fine sand:													
Nearly level thick surface phase.....	IIIs-1	80	150	25	70	700	1,100	200	600			.5	1.6
Gently sloping thick surface phase.....	IIIs-1	80	150	25	70	700	1,100	200	600			.5	1.6
Sloping thick surface phase.....	IIIs-1	80	150	25	70	700	1,100	200	600			.5	1.6
Okenece loam.....	IIIw-4			20	100							1.0	2.0
Okenece fine sandy loam.....	IIIw-4			20	100							1.0	2.0
Ona fine sand.....	IVw-2			20	40							.6	1.2
Ona loamy fine sand.....	IIIw-3			25	60							.8	1.6
Pamlico muck.....	IVw-1												
Pamlico muck, shallow phase.....	IVw-1												
Plummer fine sand.....	IVw-2			10	30							.5	1.0
Plummer fine sand, terrace phase.....	IVw-2			10	30							.5	1.0
Plummer loamy fine sand.....	IIIw-3	60	80	15	40	500	1,000			60	90	.7	1.5
Pocomoke loam.....	IIIw-4			40	100							1.0	2.0
Portsmouth loam.....	IIIw-4			40	110							1.0	2.0
Portsmouth mucky loam.....	IIIw-4			40	110							1.0	2.0
Rains fine sandy loam.....	IIw-3	120	200	35	100			250	600	80	110	1.0	2.0
Rains loamy fine sand, thick surface phase.....	IIIw-3	100	160	30	80	900	1,300	220	500	70	110	.7	1.6
Ruston fine sandy loam:													
Nearly level phase.....	I-1			35	100	800	1,200	300	700			.8	1.9
Gently sloping phase.....	IIe-1			35	100	800	1,200	300	700			.8	1.9
Eroded gently sloping phase.....	IIe-1			30	80			270	650			.5	1.6
Sloping phase.....	IIIe-1			35	100	800	1,200	300	700			.8	1.9
Eroded sloping phase.....	IIIe-1			30	80			270	650			.5	1.6
Eroded strongly sloping phase.....	IVe-1			30	80			270	650			.5	1.6
Ruston loamy fine sand:													
Nearly level thick surface phase.....	IIIs-1			25	70			260	600			.4	1.5
Gently sloping thick surface phase.....	IIIs-1			25	70			260	600			.4	1.5
Sloping thick surface phase.....	IIIs-1			25	70			260	600			.4	1.5
Strongly sloping thick surface phase.....	IVs-1			25	70			260	600			.4	1.5
Rutlege loam.....	IVw-1			25	60								
Rutlege loam, thick surface phase.....	IVw-1												
Rutlege loamy fine sand.....	IVw-1			20	50	600	1,000					.8	1.8
Rutlege mucky loam, thick surface phase.....	IVw-1												
St. Johns loamy fine sand.....	IVw-1			10	30								
Stough fine sandy loam.....	IIw-2			35	100							1.0	2.0
Stough loamy fine sand, thick surface phase.....	IIIw-3			25	70							.8	1.6
Swamp.....	VIIw-1												
Woodstown fine sandy loam:													
Nearly level phase.....	IIw-1	100	150	30	80	600	1,000	270	600			.8	1.9
Gently sloping phase.....	IIe-2	100	150	30	80			270	600			.8	1.9
Woodstown loamy fine sand, nearly level thick surface phase.....	IIIs-1	80	130	25	70			260	500			.6	1.4

¹ Lespedeza, grass, and clover.² Cow-acre-days is the number of days 1 acre will graze a cow without injury to the pasture.

of principal crops—Continued

Permanent pasture		Sweet peppers		Potatoes		Sweet-potatoes		Oats		Wheat		Soybeans		Strawberries		Tobacco	
A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
<i>Cow-acre-days</i> ³	<i>Cow-acre-days</i> ³	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>Bu.</i>	<i>24-gt. crates</i>	<i>24-gt. crates</i>	<i>Lb.</i>	<i>Lb.</i>
³ 160	³ 280	-----	-----	-----	-----	140	260	40	80	20	30	10	22	-----	-----	1, 200	1, 800
³ 160	³ 280	-----	-----	-----	-----	140	260	30	70	20	30	10	22	-----	-----	1, 200	1, 800
160	260	-----	-----	-----	-----	-----	-----	50	90	25	40	10	20	-----	-----	1, 200	2, 000
160	260	-----	-----	-----	-----	-----	-----	50	90	25	40	10	20	-----	-----	1, 200	2, 000
170	290	-----	-----	170	280	160	320	50	90	25	40	12	24	120	220	1, 400	2, 200
170	290	-----	-----	170	280	160	320	50	90	25	40	12	24	120	220	1, 400	2, 200
160	260	-----	-----	-----	-----	160	-----	50	90	30	45	10	22	-----	-----	1, 200	2, 000
100	280	-----	-----	-----	-----	-----	-----	40	70	-----	-----	12	22	-----	-----	-----	-----
150	300	80	130	160	250	-----	-----	40	80	-----	-----	12	22	-----	-----	-----	-----
150	300	-----	-----	-----	-----	-----	-----	40	80	-----	-----	10	20	-----	-----	-----	-----
³ 120	³ 240	-----	-----	-----	-----	-----	-----	30	60	-----	-----	8	18	-----	-----	-----	-----
150	260	-----	-----	140	250	150	300	30	70	12	30	10	20	110	200	1, 300	2, 000
150	260	-----	-----	140	250	150	300	30	70	12	30	10	20	110	200	1, 300	2, 000
130	260	-----	-----	130	220	120	260	40	80	16	40	8	16	100	170	1, 100	2, 000
150	260	-----	-----	140	250	150	300	30	70	12	30	10	20	110	200	1, 300	2, 000
130	260	-----	-----	130	220	120	260	40	80	16	40	8	16	100	170	1, 100	2, 000
³ 120	³ 230	-----	-----	120	200	120	250	25	60	10	25	8	14	-----	-----	1, 100	1, 800
³ 120	³ 230	-----	-----	120	200	120	250	25	60	10	25	8	14	-----	-----	1, 100	1, 800
³ 120	³ 230	-----	-----	120	200	120	250	25	60	10	25	8	14	-----	-----	1, 100	1, 800
160	260	-----	-----	-----	-----	-----	-----	30	80	-----	-----	12	20	-----	-----	-----	-----
160	260	-----	-----	-----	-----	-----	-----	30	80	-----	-----	12	20	-----	-----	-----	-----
³ 100	³ 200	-----	-----	-----	-----	-----	-----	20	35	-----	-----	8	14	-----	-----	-----	-----
³ 130	³ 240	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
³ 80	³ 140	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
³ 80	³ 140	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
³ 100	³ 180	80	120	-----	-----	-----	-----	-----	-----	-----	-----	8	14	-----	-----	-----	-----
160	260	-----	-----	150	260	-----	-----	-----	-----	-----	-----	12	24	-----	-----	-----	-----
160	260	-----	-----	150	260	-----	-----	-----	-----	-----	-----	12	26	-----	-----	-----	-----
170	260	-----	-----	150	260	-----	-----	-----	-----	-----	-----	14	26	-----	-----	-----	-----
160	300	90	140	150	220	-----	-----	-----	-----	-----	-----	10	20	100	170	1, 300	2, 000
³ 140	³ 260	80	130	140	200	-----	-----	25	70	-----	-----	8	17	90	150	1, 200	1, 800
150	250	-----	-----	-----	-----	120	220	30	70	20	30	8	20	110	200	1, 300	2, 200
150	250	-----	-----	-----	-----	120	220	30	70	20	30	8	20	110	200	1, 300	2, 200
120	250	-----	-----	-----	-----	100	200	40	80	22	35	7	16	-----	-----	1, 100	1, 700
120	250	-----	-----	-----	-----	120	220	30	70	20	30	8	20	110	200	1, 300	2, 200
120	250	-----	-----	-----	-----	100	200	40	80	22	35	7	16	-----	-----	1, 100	1, 700
120	250	-----	-----	-----	-----	100	200	35	70	22	35	7	16	-----	-----	1, 100	1, 700
³ 120	³ 200	-----	-----	-----	-----	90	200	-----	-----	-----	-----	6	14	-----	-----	1, 000	1, 500
³ 120	³ 200	-----	-----	-----	-----	90	200	-----	-----	-----	-----	6	14	-----	-----	1, 000	1, 500
³ 120	³ 200	-----	-----	-----	-----	90	200	-----	-----	-----	-----	6	14	-----	-----	1, 000	1, 500
³ 120	³ 200	-----	-----	-----	-----	90	200	-----	-----	-----	-----	6	14	-----	-----	1, 000	1, 500
³ 120	³ 250	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
³ 140	³ 250	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
³ 100	³ 250	80	120	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
130	250	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
100	200	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	⁴ 100	⁴ 200	-----	-----
160	300	-----	-----	-----	-----	-----	-----	35	70	-----	-----	10	20	-----	-----	-----	-----
³ 130	³ 240	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	8	14	-----	-----	-----	-----
130	260	-----	-----	120	220	-----	-----	30	60	-----	-----	10	18	120	200	1, 300	2, 200
130	260	-----	-----	120	220	-----	-----	30	60	-----	-----	10	18	120	200	1, 300	2, 200
³ 120	³ 240	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	8	14	-----	-----	1, 100	1, 700

³ After the first or second year, pasture grasses and legumes tend to die out on these soils.⁴ Blueberries.

Relief

The relief of soils of the county ranges from level to strongly sloping and steep. On the steeper slopes, soil materials are being constantly removed or mixed by erosion and creep and, in places, are not stable long enough to develop a soil profile of genetically related horizons. On the smoother slopes, soils are generally better developed.

On some nearly level areas, where both the internal and external drainage are slow, soils that have been in place for a long time have developed characteristics that well-drained soils do not possess. The surface layers are highly leached, geologic erosion is slow, and the subsoils are usually compact and mottled yellow and gray. They have different vegetation and micropopulation than well-drained soils and have less favorable conditions for the rapid decomposition of organic matter.

Time

The development of soil profiles requires time, usually long periods. Differences in the length of time that geologic materials have been in place are therefore commonly reflected in the distinctness of horizons in the profiles.

Some of the differences among soils in Duplin County reflect differences in time of profile development. For example, most soils of the first bottoms consist of materials that have been in place only a short time. These soils lack well-defined and genetically related horizons. These are the Alluvial soils, which are of limited extent in the county. By way of contrast, many of the soils of the uplands have distinct or prominent horizons. If a land surface remains stable for long periods of time, as have the uplands in the county, horizons in soil profiles normally become distinct. Many thousands of years seem necessary for the development of profiles of Red-Yellow Podzolic soils such as those of the Ruston and Norfolk series. Thus, the range of time during which present soils of the county have been forming must extend from a matter of decades for some of the Alluvial soils to hundreds of centuries for the Red-Yellow Podzolic soils.

Classification

Soils are classified into categories that progressively become more inclusive. The lowest categories commonly used in the field—series, type, and phase—are discussed in the section Soil Survey Methods and Definitions. The higher categories of classification, called soil orders and great soil groups, are discussed in this section. Great soil groups consist of soil series that show the same general sort of profile. The great soil groups are classified in three soil orders—zonal, intrazonal, and azonal. The great soil groups, soil orders, and parent materials of the soil series for Duplin County are given in table 7.

Zonal soils

Zonal soils have characteristics that reflect the influence of the active factors of soil genesis—climate and living organisms. The profiles of zonal soils have well-differentiated horizons. In this county, the zonal order is

TABLE 7.—Higher categories and the parent materials of the soil series

Order and great soil group	Series	Parent material
Zonal: Red-Yellow Podzolic.	Magnolia.....	Sandy clays.
	Kenansville.....	Interbedded sands and sandy clays.
	Kalmia.....	Stream alluvium.
	Marlboro.....	Sandy clays.
	Norfolk.....	Argillaceous sands and sandy clays.
	Ruston.....	Same.
	Caroline.....	Fine sandy clay or clay.
	Craven.....	Fine sandy clay or clay.
	Duplin.....	Sandy clays.
	Goldsboro.....	Argillaceous sands and sandy clays.
Gray-Brown Podzolic.	Izagara.....	Stream alluvium.
	Woodstown.....	Interbedded sands and sandy clays.
Intrazonal: Humic Gley.....	Bayboro.....	Clay and silty clays.
	Rutlege.....	Sands.
	Johnston.....	Stream alluvium.
	Oknee.....	Stream alluvium.
	Pocomoke.....	Interbedded sands and sandy clays.
	Portsmouth.....	Interbedded argillaceous sand and sandy clays.
Low-Humic Gley---	Bladen.....	Fine sandy clay or clay.
	Coxville.....	Same.
	Fallsington.....	Interbedded sands and sandy clays.
	Myatt.....	Stream alluvium.
	Plummer.....	Sands.
	Rains.....	Interbedded argillaceous sands and sandy clays.
	Dunbar.....	Sandy clays.
	Lenoir.....	Fine sandy clay or clay.
	Lynchburg.....	Argillaceous sands and sandy clays.
	Stough.....	Stream alluvium.
Ground-Water Podzolic.	Dragston.....	Interbedded sands and sandy clays.
	Immokalee.....	Sands.
Bog.....	Leon.....	Sands.
	St. Johns.....	Sands.
Azonal: Regosols.....	Ona.....	Sands.
	Pamlico muck	Plant residues.
	Eustis.....	Sands.
	Lakeland.....	Sands.
	Galestown.....	Sands.
	Klej.....	Sands.

represented by the Red-Yellow Podzolic and the Gray-Brown Podzolic great soil groups. In the Red-Yellow Podzolic group, four soil series intergrade to the Low-Humic Gley great soil group; in the Gray-Brown Podzolic group one soil series intergrades to the Low-Humic Gley great soil group.

RED-YELLOW PODZOLIC SOILS

Red-Yellow Podzolic soils are a group of well-developed and well-drained acid soils having thin organic (A_0) and organic-mineral (A_1) horizons over a light-colored bleached (A_2) horizon, over a red, yellowish-red, or yellow and more clayey (B) horizon. The parent materials are all more or less siliceous. Coarse reticulate streaks or mottles of red, yellow, brown, and light gray are charac-

teristic of the deep horizons of Red-Yellow Podzolic soils where parent materials are thick (10). These soils have developed under mixed deciduous-coniferous forest, in a warm-temperate, moist climate.

Soils of the Red-Yellow Podzolic great soil group occur mainly in the northern and central parts of the county and on the better drained stream terraces. They have been developed from materials that are probably low in bases. This great soil group consists of both red and yellow members.

The only red member of the Red-Yellow Podzolic soils in the county is the Magnolia series. It has developed from marine sediments of the Coastal Plain formations on nearly level to sloping relief. It is characterized by a pale-brown surface soil over a compact red subsoil. It is well drained and the profile is moderately well to well developed.

A typical profile of the Magnolia series located in a tilled field is described as follows:

- A_p 0 to 8 inches, pale-brown (10YR 6/3) fine sandy loam or loamy fine sand; very weak fine crumb to single-grain structure; very friable when moist; roots and water penetrate readily; soil material has been thoroughly mixed by tillage; lower boundary abrupt and smooth.
- A₂ 8 to 10 inches, brownish-yellow (10YR 6/6, 7/6) loamy fine sand or light fine sandy loam; weak fine crumb structure; very friable when moist; a few very thin horizontal streaks of yellowish red; roots and water penetrate easily; lower boundary gradual and wavy.
- B₁ 10 to 15 inches, yellowish-red (5YR 5/6) light fine sandy clay loam; weak medium subangular blocky structure; friable when moist; a few splotches of less red material; lower boundary gradual and wavy.
- B₂₁ 15 to 26 inches, red (2.5YR 5/8) fine sandy clay loam; weak medium subangular blocky structure; plastic and sticky when wet and firm when dry; smooth and friable when moist; lower boundary gradual and wavy.
- B₂₂ 26 to 52 inches, red (10R 4/8) clay loam; weak, coarse subangular blocky structure that breaks easily into soft coarse crumbs; plastic and sticky when wet, but firm when moist; lower boundary gradual and wavy.
- C 52 to 70 inches+, red (10R 4/6) sandy clay loam with few distinct coarse mottles and vertical streaks of reddish yellow (5YR 6/6); friable when moist; consists largely of sandy clay with interbedded thin layers of sandy loam, all marine sediments of the Coastal Plain formations.

The yellow members of the Red-Yellow Podzolic great soil group are the Kalmia, Kenansville, Marlboro, Norfolk, Ruston, and Caroline series. They are all well drained and have developed under similar climate and vegetation. They vary somewhat in degree of horizonation, but all have at least a moderately well developed profile. Relief ranges from nearly level on the broad interstream areas to sloping or strongly sloping on marine terrace escarpments and stream breaks. But differences among these soils are not due primarily to differences in slope. Probably the outstanding difference is the kind of parent material from which the soils were derived. The soils have been developed from marine sediments or from old alluvium washed from these sediments.

The Norfolk series is the representative yellow member of the Red-Yellow Podzolic great soil group. The Kalmia series is similar to the Norfolk series, but it occurs on stream terraces and is of alluvial origin. The Ruston series differs from the Norfolk series in having a coarser surface soil and a browner color throughout the profile.

It is intermediate between the Norfolk and Magnolia series in color of B horizon. The Marlboro series is browner and finer textured throughout the profile than the Norfolk series. The Kenansville series is about the same color as the Norfolk series, but the profile is coarser textured and, generally, is underlain by a substratum of sand. The Caroline series is much finer textured and redder in the B horizon, than the Norfolk and it is prominently mottled in the C horizon.

A profile of the Norfolk series located in a wooded area is described as follows:

- A₁ 0 to 3 inches, dark-gray (N 4/0) loamy fine sand; weak fine crumb structure; many white sand grains give a salt-and-pepper effect; very friable when moist; many large and small roots; lower boundary wavy and clear.
- A₂ 3 to 15 inches, light yellowish-brown (2.5Y 6/4) loamy fine sand; weak fine crumb structure; friable when moist, and soft when dry; contains some material from the B₁ or B₂ horizon; some large and small roots; lower boundary sharp and wavy.
- B₁ 15 to 18 inches, yellowish-brown (10YR 5/6) light fine sandy clay loam; weak medium subangular blocky structure; friable when moist, but slightly hard when dry; few roots; root channels contain materials from A₁ and A₂ horizons; lower boundary gradual and wavy.
- B₂ 18 to 30 inches, dark yellowish-brown (10YR 4/4) fine sandy clay loam; weak medium subangular blocky structure; friable when moist and hard when dry; lower boundary gradual and wavy.
- B₃ 30 to 42 inches, yellowish-brown (10YR 5/9) fine sandy loam; weak medium subangular blocky structure; friable when moist and soft to slightly hard when dry; lower boundary gradual and wavy.
- C₁ 42 to 48 inches+, yellowish-brown (10YR 5/4) fine sandy loam with lumps of brown fine sandy clay loam; mottled with red (10R 4/6) and strong brown (7.5YR 5/6); mottles are common, medium, and distinct; derived from sandy loam beds of the Coastal Plain formations.

RED-YELLOW PODZOLIC SOILS INTERGRADING TO LOW-HUMIC GLEY SOILS

The Goldsboro, Duplin, Izagora, and Craven series are slightly less well developed and are less well drained than other Red-Yellow Podzolic soils. Because of slight wetness, they are considered intergrades to the Low-Humic Gley soils. Their characteristics, however, are more like those of the typical Red-Yellow Podzolic soils than of typical Low-Humic Gley soils. They have been developed under a deciduous-coniferous forest in a warm climate, from marine sediments. These soils differ in color and in texture; their parent materials probably differed in original mineralogical composition and in content of sand, silt, and clay. Members of this group have about the same drainage characteristics. They are scattered among other soil series and occur over most of the county.

The Goldsboro series is representative of this subgroup. The Duplin series generally has a less distinct B₂ horizon and is finer textured throughout than the Goldsboro series. The Izagora series has developed from alluvial deposits of the stream terraces; it is similar to Duplin but finer textured than Goldsboro soils. The profiles of the Goldsboro, Duplin, and Izagora are all moderately well drained. The Craven series is similar to the Norfolk soil, a yellow member of the Red-Yellow Podzolic group, but is finer textured and slightly mottled in the lower part of the B horizon.

The following is a profile of the Goldsboro series in a wooded area:

- A₀ ½ to 0 inch, dark-brown disintegrated and partly decomposed leaves and small twigs.
- A₁ 0 to 6 inches, very dark gray (10YR 3/1) fine sandy loam; weak fine crumb structure; soft when dry but friable when moist; fairly high in organic matter; acid; lower boundary sharp and wavy.
- A₂ 6 to 12 inches, grayish-brown (2.5Y 5/2) fine sandy loam; weak fine crumb structure; slightly hard when dry and friable when moist; root channels are coated with organic matter and filled with material from the A₁ horizon; many small and large roots; lower boundary gradual and wavy.
- B₁ 12 to 18 inches, light olive-brown (2.5Y 5/4) fine sandy clay loam; weak fine subangular blocky structure; root channels contain material from higher horizons; only a few roots; slightly hard when dry and friable when moist; lower boundary gradual and wavy.
- B₂₁ 18 to 24 inches, light olive-brown (2.5Y 5/4) light fine sandy clay loam; coarse, common, faint mottlings of yellowish brown (10YR 5/6); medium subangular blocky structure; slightly hard when dry and slightly sticky and slightly plastic when wet; few roots; lower boundary gradual and wavy.
- B₂₂ 24 to 46 inches, mottled yellowish-brown (10YR 5/8), light olive-brown (2.5Y 5/4), and gray fine sandy clay loam; mottles are coarse, common, and distinct; weak subangular blocky structure; slightly hard when dry and firm when moist; lower boundary wavy and gradual.
- C_u 46 to 56 inches, mottled yellowish-brown (10YR 5/8), light olive-brown (2.5Y 5/4), and red (10R 4/8) fine sandy clay loam; mottles coarse, common, and prominent; moderate medium subangular blocky structure; slightly sticky when wet and friable when dry; derived from beds of sandy clay loam in the Coastal Plain formations.

GRAY-BROWN PODZOLIC SOILS INTERGRADING TO LOW-HUMIC GLEY SOILS

Gray-Brown Podzolic soils are a group of well-developed and well-drained acid soils having thin organic (A₀) and organic-mineral (A₁) horizons over a light-colored (A₂) horizon grading into a brown or yellowish brown and more clayey (B) horizon. The soils of this group are less strongly weathered than Red-Yellow Podzolic soils. They are commonly formed under deciduous forest in humid, cool-temperate climates. They may also be formed in warm-temperate or tropical regions, apparently as early stages in development or as forerunners of Red-Yellow Podzolic soils.

In this county the Gray-Brown Podzolic group is represented only by the Woodstown series. This series is less well drained than typical Gray-Brown Podzolic soils. For this reason the series is considered an intergrade to Low-Humic Gley soils, although it is placed in the Gray-Brown Podzolic group. The Woodstown soil has been formed from the same kinds of parent materials as the Norfolk and Kenansville series but is thought to have been in place a shorter time and consequently is not so strongly weathered and leached.

The following is a profile description of Woodstown fine sandy loam examined in a forested area:

- A₁ 0 to 3 inches, very dark gray (10YR 3/1) fine sandy loam; white quartz sand mixed with black organic matter gives this soil a salt-and-pepper color; weak fine crumb structure; friable when moist and loose when dry; many small and large roots are present; lower boundary clear and smooth.
- A₂ 3 to 12 inches, pale-yellow (2.5Y 7/4) fine sandy loam; weak fine crumb structure; friable when moist and

soft when dry; root channels contain material from A₁ horizon; a few large and small roots; lower boundary clear and smooth.

- B₂₁ 12 to 20 inches, light yellowish-brown (2.5Y 6/4) light fine sandy clay loam; weak medium subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet, and slightly hard when dry; lower boundary gradual and wavy.
- B₂₂ 20 to 28 inches, mottled yellow (2.5Y 7/6), pale-yellow (2.5Y 7/4), and brownish-yellow (10YR 6/8) fine sandy loam; mottlings few, faint, and fine; weak fine subangular blocky structure; friable when moist and soft when dry; lower boundary gradual and wavy.
- B₃ 28 to 38 inches, mottled white (2.5Y 8/2), pale-yellow (2.5Y 7/4), and yellow (2.5Y 7/6) fine sandy loam that grades to a fine sand in lower part; mottlings distinct, common, and medium; very weak fine subangular blocky structure; very friable when moist and soft when dry; lower boundary gradual and wavy.
- C 38 to 42 inches+, white (2.5Y 8/2) fine sand; single-grain structure; flows when saturated with water and is loose when dry; developed from sand beds of the Coastal Plain formations.

Intrazonal soils

The intrazonal soils have characteristics that reflect the dominating influence of some local factor of relief, parent material, or age over the normal effect of climate and vegetation (11). The profiles of intrazonal soils are more or less well developed. In this county, the intrazonal order consists of the Humic Gley, the Low-Humic Gley, the Ground-Water Podzol, and the Bog great soil groups. In the Low-Humic Gley group, four series intergrade to the Red-Yellow Podzolic group and one series intergrades to the Gray-Brown Podzolic group.

HUMIC GLEY SOILS

The Humic Gley great soil group consists of poorly drained to very poorly drained hydromorphic soils with dark-colored organic-mineral horizons of moderate thickness underlain by mineral gley horizons.

The members of the Humic Gley great soil group in Duplin County are the Portsmouth, Bayboro, Okenece, Rutlege, Pocomoke, and Johnston series. They have developed under a warm moist climate from marine sediments of the Coastal Plain formations (10). The vegetation under which they characteristically develop is the swamp type of forest, mainly maples, pond and loblolly pines, gum, and many species of water-tolerant shrubs. These soils have fairly thick black surface horizons that contain a high percentage of organic matter. They vary from acid to strongly acid and are low in bases.

The Portsmouth series is representative of the Humic Gley soils. The subsoil in this series is mainly fine sandy clay loam but may grade to the heavy fine sandy loam in this county. The Bayboro series has a thick black surface soil like that of the Portsmouth series, but the B horizon is finer textured. The Okenece subsoil contains more sand than the Portsmouth series, and the parent material is of alluvial origin in stream terraces. The Rutlege series has a sandy profile with no accumulation of clay in the B horizon. The Pocomoke series is similar to the Portsmouth series in color of the surface soil, but the subsoil is sandier. The Pocomoke subsoil consists of fine sandy loam with pockets of sand and loamy fine sand. The Johnston series is formed from stream alluvium in flood plains.

The following is a profile of the Portsmouth series from a wooded area:

- A₀ 1 to 0 inch, slightly altered leaves and twigs; quite fibrous.
- A₁ 0 to 15 inches, black (2.5Y 2/0) loam; white quartz sand mixed with black organic matter gives this soil a salt-and-pepper color; weak fine crumb structure; friable when moist; large and small roots; lower boundary clear and smooth.
- G₁ 15 to 18 inches, very dark gray (2.5Y 3/0) heavy fine sandy loam; weak fine crumb structure; friable to firm when moist; lower boundary gradual and wavy.
- G₂ 18 to 42 inches+, gray (2.5Y 5/0) fine sandy clay loam, massive; firm; derived from sandy clay beds of the Coastal Plain formations.

LOW-HUMIC GLEY SOILS

The Low-Humic Gley great soil group consists of somewhat poorly to poorly drained soils with thin surface horizons that are moderately high in organic matter. These horizons are underlain by mineral gley horizons or by mottled gray and brown gleylike horizons. Low-Humic Gley soils range in texture from sand to clay, and they have correspondingly wide variations in the physical and chemical properties of their parent materials. These soils occur mostly under swamp forest; some areas may occur under a cover of marsh plants. Most Low-Humic Gley soils are medium to strongly acid (10).

The Rains, Bladen, Coxville, Fallsington, Plummer, and Myatt series are members of the Low-Humic Gley great soil group. They developed on stream terraces and on nearly level uplands, in a warm moist climate, and under vegetation consisting chiefly of gum, pine, maple, and water-tolerant bushes. The soils are scattered among the other soils of the county, but they occur in greater proportion in the southern and eastern parts. During the rainy season, they are very wet, muddy, and somewhat sticky. The water table is at or near the surface in wet periods and is within 48 inches of the surface most of the time. The series differ from each other primarily in texture and consistence.

The Rains series is representative of the Low-Humic Gley soils. The Coxville series is heavier in texture and more mottled than the Rains soils. The Bladen series does not contain as much sand in the B horizon as the Coxville and is finer textured than the Rains soils. The Fallsington series is less well developed than the Rains and has a coarser texture. The Plummer series has a sandy profile that has very little horizon differentiation. It is very similar to Regosols in its low degree of horizon differentiation but is placed in this group because of its wetness. The Myatt series is similar to the Rains but it developed from stream alluvium.

A profile of the Rains series is described as follows:

- A₀ 1 to 0 inch, very dark brown (10YR 2/2) layer of organic matter; partly decomposed leaves and twigs.
- A₁ 0 to 4 inches, black (10YR 2/1) with some inclusions of very dark grayish brown (10YR 3/2) fine sandy loam; weak fine crumb structure; friable when moist and soft when dry; large and small roots are common in this layer; lower boundary clear and smooth.
- A₂ 4 to 8 inches, gray (5Y 5/1) fine sandy loam containing less organic matter than the horizon above; some inclusions of very dark grayish brown from the horizon above; weak fine crumb structure; friable when moist and soft when dry; large and small roots present in this horizon; lower boundary wavy and gradual.
- B_{2g} 8 to 28 inches, mottled gray (5Y 5/1), yellowish-red (5YR 5/8), and yellowish-brown (10YR 5/8) light fine sandy clay loam; mottlings few, medium, and faint; medium subangular blocky structure; slightly

hard when dry and slightly sticky and slightly plastic when moist; some roots in this horizon; lower boundary wavy and gradual.

- B_{3g} 28 to 38 inches, mottled gray (5Y 5/1), yellowish-red (5YR 5/8), and yellowish-brown (10YR 5/8) fine sandy clay loam; mottlings common, faint, and weak; weak medium angular blocky structure; hard when dry and plastic when wet; roots absent in this horizon; lower boundary gradual and wavy.
- CG 38 to 48 inches+, gray (5Y 5/1) fine sandy clay loam; massive; hard when dry and slightly plastic to plastic when moist; material is derived from the sandy clay loam beds of the Coastal Plain formations.

LOW-HUMIC GLEY SOILS INTERGRADING TO RED-YELLOW PODZOLIC SOILS

The Stough, Lynchburg, Dunbar, and Lenoir series are slightly better drained than other Low-Humic Gley soils, and for this reason they are considered intergrades to the Red-Yellow Podzolic group. Their characteristics, however, are more like those of typical Low-Humic Gleys than of typical Red-Yellow Podzolic soils. They have poorer drainage, less well developed profiles, more gray colors, and darker surface soils than any of the Red-Yellow Podzolic soils. They developed in a warm moist climate under a coniferous-deciduous forest vegetation. Their parent materials were marine deposits or old alluvium derived from these deposits, but the materials differ mineralogically and chemically.

The Stough series differs from the other series in this group in that it is derived from stream alluvium. It has about the same consistence, texture, structure, and color as the Lynchburg series. The Dunbar series has about the same color as the Lynchburg series but has a finer texture. It also differs slightly in consistence and structure. The Lenoir series is finer textured than either the Lynchburg or the Dunbar series and differs from them in consistence and structure.

The Lynchburg series is representative of these intergrades; a profile in a wooded area is as follows:

- A₁ 0 to 6 inches, very dark gray (10YR 3/1) fine sandy loam high in organic matter; weak fine crumb structure; many large and small roots; slightly sticky when wet and friable when moist; lower boundary clear and smooth.
- A₂ 6 to 14 inches, pale-olive (5Y 6/3) and light brownish-gray (2.5Y 6/2) fine sandy loam; weak medium crumb structure; friable when moist and slightly hard when dry; mottlings are common, fine, and faint; many small and large roots; some material from horizon above included; root channels filled with material from A₁ horizon or coated with organic matter; lower boundary gradual and wavy.
- B_{2g} 14 to 30 inches, light brownish-gray (2.5Y 6/2) fine sandy clay loam, mottled with brownish yellow (10YR 6/6) and dark yellowish brown (10YR 4/4); weak medium subangular blocky structure; slightly plastic when wet and firm when moist; lower boundary gradual and wavy.
- B_{3g} 30 to 54 inches, light-gray (N 7/0) fine sandy clay loam, mottled with pale yellow (2.5Y 8/4) and dark yellowish brown; weak medium angular blocky structure; slightly plastic when wet and firm when moist; no roots; material derived from sandy clay beds of the Coastal Plain formations.

LOW-HUMIC GLEY SOILS INTERGRADING TO GRAY-BROWN PODZOLIC SOILS

The Dragston series is the only member of this subgroup. It is slightly better drained than typical Low-Humic Gley soils and is therefore considered an intergrade to one of the zonal great soil groups. The Dragston series is a member of the same catena as the Woodstown

series and is thought to be less weathered than Low-Humic Gley soils that intergrade toward the Red-Yellow Podzolic group. The Dragston series is therefore considered to be a Low-Humic Gley soil intergrading toward the Gray-Brown Podzolic group.

The Dragston soil is somewhat poorly drained and has a thin, dark-colored surface layer. During rainy periods the water table remains near the surface and the soil itself becomes wet and muddy. The series has been formed from marine sediments of Coastal Plain formations under a forest of gum, pine, and water-tolerant bushes and shrubs.

A profile of Dragston fine sandy loam located in a cornfield is described as follows:

- A₁ 0 to 10 inches, very dark grayish brown (10YR 3/2) loamy fine sand; single-grain to very weak fine crumb structure; soft when dry and very friable when moist; a considerable amount of organic matter; lower boundary clear and smooth.
- A₂ 10 to 15 inches, gray to light-gray (10YR 6/1) loamy fine sand; single-grain to weak fine crumb structure; friable to loose when moist and soft to loose when dry; not much organic matter; lower boundary gradual and wavy.
- B₁ 15 to 20 inches, gray to light-gray (10YR 6/1) fine sandy loam mottled with olive yellow (5Y 6/8); mottles are few, faint, and fine; weak medium subangular blocky structure; friable when moist and slightly sticky when wet; contains some large and small roots; low content of organic matter; lower boundary gradual and wavy.
- B_{2g} 20 to 28 inches, brownish-yellow (10YR 6/6) heavy fine sandy loam; light-gray (10YR 7/1) mottlings medium, common, and prominent; weak medium subangular blocky structure; hard when dry and friable to firm when moist; some large and small roots; lower boundary gradual and wavy.
- B_{3g} 28 to 42 inches, mottled light-gray (2.5Y 7/2), pale yellow (2.5Y 8/4), and white (2.5Y 8/8) light fine sandy loam; mottlings many, medium, prominent, and mainly gray; friable when moist, slightly sticky when wet, and slightly hard when dry; may be slightly stratified; derived from sandy loam deposits of the Coastal Plain formations.

GROUND-WATER PODZOL SOILS

The Ground-Water Podzols have a thin organic layer over a light-gray sandy leached layer that rests on a dark-brown B horizon that is irregularly cemented with iron or organic compounds, or both (11). They are developed from somewhat poorly drained to poorly drained sandy deposits in a warm, moist climate. The vegetative cover generally consists of coniferous trees mixed with a few deciduous trees.

The Leon, Immokalee, St. Johns, and Ona series are members of the Ground-Water Podzol great soil group. The Leon series is representative of this group of soils. It has been formed from acid light-colored fine sands on level or nearly level relief under a vegetation consisting chiefly of wiregrass and longleaf pine. In some areas, other types of vegetation may also be present. The profile of Leon series is one of the most striking in the county (see fig. 7). Horizons are well defined, and they contrast to a high degree. The differentiation of horizons seems to be caused by translocation of organic matter in the profile.

The Immokalee series differs from the Leon soil in having a thicker white sandy A₂ horizon. In addition, the dark B horizon is at a greater depth, ranging from about 20 to 30 inches. The B horizon is similar to that

of the Leon series. Immokalee and Leon soils were derived from the same type of parent material.

The St. Johns series differs from the Leon series in having a black surface layer that is 4 to 16 inches thick. This layer may rest directly on the B horizon or it may be underlain by white sand that is from 12 to 16 inches thick, which, in turn, rests on the very dark B horizon. The St. Johns series developed under a forest consisting chiefly of pond pine and water-tolerant bushes and shrubs. The B horizon in the Ona series is less well developed and usually is thinner than that of the St. Johns soils.

A profile of the Leon series located in a wooded area is as follows:

- A₁ 0 to 6 inches, gray fine sand (10YR 5/1); white sand mixed with black organic matter gives this soil a salt-and-pepper color; single-grain structure; loose when moist; contains grass and tree roots; lower boundary clear and wavy.
- A₂ 6 to 12 inches, light gray (10YR 7/1) fine sand; single-grain structure; loose when moist; contains a few roots and is very low in organic matter; soil dries to a white color; lower boundary abrupt and wavy to irregular.
- B_{21h} 12 to 16 inches, very dark grayish brown (10YR 3/2) fine sand; weakly to strongly cemented; high in organic matter; massive and brittle; lower boundary clear and wavy to irregular.
- B_{22h} 16 to 20 inches, dark grayish brown (10YR 4/2) fine sand; weakly cemented; somewhat easily dug out and can be crumbled by the hand; massive; lower boundary clear and wavy.
- C 20 to 40 inches, mottled yellow (2.5Y 7/6), light yellowish brown (10YR 6/4), and yellowish brown (10YR 5/4) fine sand; single-grain structure; loose when moist; material derived from sand beds of the Coastal Plain formations.

BOG SOILS

Bog soils are so located that water stands at or above the surface much of the time. They formed under a warm, moist climate under a forest of conifers and deciduous trees and water-tolerant bushes, shrubs, and grasses. The plant growth accumulated and built up organic matter known as peat, muck, or peaty muck (11). Muck is peat in a more advanced stage of decomposition and usually has a greater mineral content. Pamlico muck is the only member of the Bog great soil group in this county.

The following is a profile of Pamlico muck examined in a wooded area in Angola Bay:

- 0 to 4 inches, black organic matter, partly decomposed leaves, and marsh grass.
- 4 to 46 inches, black organic matter; some charcoal and grains of sand; lower part of horizon contains more sand.
- 46 inches +, gray sand, fine sandy loam, or fine sandy clay loam; pockets and seams of other textures.

Azonal Soils

The azonal order consists of soils without well-developed profile characteristics. Their characteristics are largely those inherited from the parent materials. These materials either have not been exposed long enough to soil-forming processes or are too resistant to them for soil characteristics to develop. Fresh alluvium, dry sands, and the soils on steep rocky hillsides are the principal examples of azonal soils. In this county the azonal order is represented by the Regosol great soil group.

REGOSOLS

Regosols are soils lacking distinct genetically related horizons and formed from deep unconsolidated sediments. They are largely confined to sand dunes, loess, glacial drift, and similar unconsolidated sediments on steeply sloping lands (11). Four series in Duplin County are considered to be Regosols. These are the Lakeland, Eustis, Galestown, and Klej. The first three are well drained, whereas the last is not. Furthermore, each series has a few features shared with some zonal or intrazonal group.

REGOSOLS ASSOCIATED WITH RED-YELLOW PODZOLIC SOILS

The Lakeland and Eustis series are commonly associated with Red-Yellow Podzolic soils. They also share some features with those soils, as for example, the high degrees of weathering, leaching, and acidity. Lakeland and Eustis soils have been formed from marine sediments of Coastal Plain formations under hardwood and pine, with an understory of myrtle and bay bushes. The two are comparable in profile except that the Eustis soils are browner or redder in color and may be very slightly higher in clay and silt. Both are well drained, strongly acid, low in organic matter and plant nutrients, very sandy, and very susceptible to leaching.

A profile of the Lakeland series in a wooded area is as follows:

- A₁ 0 to 4 inches, very dark gray (2.5Y 3/0) fine sand; white quartz sand mixed with organic matter gives the soil a salt-and-pepper color; single-grain structure; very friable when moist; low in organic matter; contains many large and small roots; lower boundary clear and wavy.
- AC 4 to 8 inches, grayish-brown (10YR 5/2) fine sand; single-grain structure; loose when moist; low in organic matter; contains large and small roots; root channels contain material from upper horizon; lower boundary gradual and wavy.
- C₁ 8 to 34 inches, pale-yellow (2.5Y 7/4) fine sand; single-grain structure; loose when moist; low in organic matter; contains few small and large roots; lower boundary gradual and wavy.
- C₂ 34 to 44 inches, light yellowish-brown (10YR 6/4) fine sand, mottled with light yellowish brown (2.5Y 6/4) and light brownish gray (2.5Y 6/2); mottlings are medium, distinct, and common; single-grain structure; loose when moist.

REGOSOLS ASSOCIATED WITH GRAY-BROWN PODZOLIC SOILS

The Galestown series is commonly associated with Gray-Brown Podzolic soils. It shares some characteristics with that group, as it is less red or yellow in color than typical Red-Yellow Podzolic soils. Like the Lakeland and Eustis, the Galestown soil has formed from marine sediments in Coastal Plain formations, chiefly under loblolly pine and oak mixed with bay and myrtle bushes, native grasses, and weeds. As compared with the Lakeland series, Galestown soil is slightly more fertile and also slightly less droughty because of a higher water table. It is paler and less red in color than the Eustis.

A profile of Galestown soil located in a wooded area is as follows:

- A 0 to 10 inches, nearly loose, brown (10YR 5/3) fine sand; single-grain structure; loose when dry; lower boundary clear and wavy.
- AC 10 to 36 inches, brownish-yellow (10YR 6/6) to yellowish-brown (10YR 5/6) fine sand; single-grain structure; nearly loose when moist or dry; upper part contains some material from A horizon; lower boundary gradual and wavy.

- C 36 to 48 inches+, white, loose fine sand; single-grain structure; loose when moist; thin bands of yellowish-brown fine sand may occur in upper part of this horizon.

REGOSOLS WITH RESTRICTED DRAINAGE

The Klej series is less well drained than the Galestown series, though both are from comparable parent materials. The former commonly occurs at lower elevations and has a higher water table. The Klej series might be considered a Regosol that is intergrading to the Low-Humic Gley group. It has been formed from sandy marine sediments under a cover consisting mainly of loblolly pine and oak mixed with bay and myrtle bushes and some native grasses. The Klej soil is sandy, acid, and low in organic matter.

A profile in a wooded area is as follows:

- A₁ 0 to 8 inches, very dark gray (10YR 3/1) fine sand; nearly loose, single-grain structure; contains many large and small roots; low in organic matter; lower boundary clear and wavy.
- A₂ 8 to 11 inches, light brownish-gray (2.5Y 6/2) loose fine sand; single-grain structure; loose when moist; contains some roots; organic-matter content is low; lower boundary gradual and wavy.
- C₁ 11 to 17 inches, light yellowish-brown (2.5Y 6/4) fine sand; mottled with light gray (2.5Y 7/2) and yellowish red (5YR 5/8); mottlings few, faint, and fine; single-grain structure; loose when moist; contains few if any roots; very low in organic matter; lower boundary gradual and wavy.
- C₂ 17 to 26 inches, mottled light yellowish-brown (2.5Y 6/4) and light brownish-gray (2.5Y 6/2) fine sand; mottles common, faint, and fine; single-grain structure; loose when moist; lower boundary gradual and wavy.
- C₃ 26 to 42 inches+, pale-yellow to white, wet, loose fine sand; occasional spherical pockets of strong-brown loamy fine sand are more numerous with increase in depth; single-grain structure.

Engineering Applications³

This soil survey report for Duplin County, North Carolina, contains information which can be used by engineers to:

- (1) Make soil and land-use studies that will aid in the selection and development of industrial, business, residential, and recreational sites.
- (2) Make estimates of runoff and erosion characteristics for use in designing drainage structures and planning dams and other structures for water and soil conservation.
- (3) Make reconnaissance surveys of soil and ground conditions that will aid in selecting highway and airport locations and in planning detailed soil surveys for the intended locations.
- (4) Locate sand and gravel for use in structures.
- (5) Correlate pavement performance with types of soil and thus develop information that will be useful in designing and maintaining the pavements.
- (6) Determine the suitability of soil units for cross-country movements of vehicles and construction equipment.

³ This section, except table 12 and the explanatory text, was prepared by the Division of Physical Research, Bureau of Public Roads. Test data in table 8 were obtained in the Soils Laboratory, Bureau of Public Roads.

TABLE 8.—*Engineering test data*¹ for soil samples

Soil name and location	Parent material	Bureau of Public Roads report number	Depth	Horizon	Moisture-density	
					Maximum dry density	Optimum moisture
Caroline fine sandy loam:			<i>Inches</i>		<i>Lb. per cu. ft.</i>	<i>Percent</i>
1.0 mile SE. of Kenansville.....	Coastal Plain sandy clay and clay.	91701	5-12	A ₂	122	8
		91702	14-22	B ₂	105	19
		91703	31-42+	C ₁	101	23
Duplin fine sandy loam:						
2.5 miles N. of Faison.....	Coastal Plain sandy clay.....	91689	0-8	A _p	121	9
		91690	10-23	B ₂	114	15
		91691	34-60+	C ₁	118	11
Goldsboro fine sandy loam:						
4.0 miles NNW. of Summerlin.....	Coastal Plain sand and sandy clay.	91713	0-6	A ₁	102	15
		91714	12-18	B ₁	125	10
		91715	18-46	B ₂₁ and B _{2g}	120	13
Johnston loam:						
5.5 miles NE. of Beautaneus.....	Stream alluvium.....	91695	0-6	A ₁	89	25
		91696	6-18	A ₂	91	23
		91697	26-30	A ₄	116	14
Lakeland fine sand:						
2.6 miles N. of Cabin.....	Coastal Plain sand.....	91704	0-4	A ₁	105	13
		91705	8-34	B _{21o}	110	12
		91706	34-44	B _{22o}	110	12
Lenoir fine sandy loam:						
10.2 miles NW. of Wallace.....	Coastal Plain clay.....	91716	0-8	A _p	115	13
		91717	12-30	B _{22g}	102	20
		91718	30-42	C ₁₁	102	21
Lynchburg fine sandy loam:						
4.0 miles W. of Pink Hill (Lenoir Co.)..	Coastal Plain sand and sandy clay.	91707	0-6	A ₁	114	12
		91708	14-30	B _{2g}	128	10
		91709	30-54	B _{3g}	124	11
Marlboro fine sandy loam:						
2.4 miles N. of Faison.....	Coastal Plain sandy clay.....	91692	0-5	A _p	117	10
		91693	18-32	B ₂₂	112	16
		91694	48-56+	C ₁₂	116	14
Norfolk fine sandy loam:						
3.8 miles SE. of Warsaw.....	Coastal Plain sand and sandy clay.	91686	2.5-15	A ₂	118	9
		91687	18-30	B ₂	112	16
		91688	42-48+	C ₁	118	14
Rains fine sandy loam:						
1.2 miles NE. of Teachey.....	Coastal Plain sand and sandy clay.	91710	0-4	A ₁	91	21
		91711	8-28	B _{2g}	126	10
		91712	28-38	B _{3g}	116	14
Ruston fine sandy loam:						
5.2 miles NE. of Beautaneus.....	Coastal Plain sand and sandy clay.	91698	0-6	A _p	115	11
		91699	20-42	B ₂	116	15
		91700	42-48	B ₃	111	17

¹ Tests performed by Bureau of Public Roads according to standard procedures of the American Association of State Highway Officials (A. A. S. H. O.) (1).

² According to the American Association of State Highway Officials Designation: T 88. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the A. A. S. H. O. procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on

taken from 11 soil profiles, Duplin County, N. C.

Mechanical analysis ²											Liquid limit	Plas- ticity index	Classification	
Percentage passing sieve						Percentage smaller than				A. A. S. H. O. ³			Unified ⁴	
$\frac{3}{4}$ -in.	$\frac{3}{8}$ -in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 60 (0.25 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.					0.002 mm.
100	98	98	98	90	80	41	30	18	9	4	NP	NP	A-4 (1)	SM
-----	-----	-----	100	94	88	65	58	50	45	38	53	26	A-7-6 (14)	MH-CH
-----	-----	-----	100	97	94	79	71	61	52	46	66	37	A-7-6 (20)	CH
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	100	91	83	58	46	27	12	7	16	1	A-4 (5)	ML
-----	-----	-----	100	92	86	67	58	44	32	29	36	16	A-6 (9)	CL
-----	-----	-----	100	91	84	62	52	37	24	22	34	17	A-6 (8)	CL
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	100	94	82	40	31	20	11	7	26	0	A-4 (1)	SM
-----	-----	-----	100	95	86	51	38	24	15	12	18	4	A-4 (3)	ML-CL
-----	-----	-----	100	92	80	46	39	29	21	19	26	10	A-4 (2)	SC
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	100	97	97	62	52	38	26	17	42	6	A-5 (5)	OL
-----	-----	-----	100	98	92	45	32	20	12	8	NP	NP	A-4 (2)	SM
-----	-----	-----	100	99	95	46	37	27	20	17	22	4	A-4 (2)	SM-SC
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	100	83	39	6	6	6	4	2	NP	NP	A-3 (0)	SP-SM
-----	-----	-----	100	85	47	7	7	7	5	2	NP	NP	A-3 (0)	SP-SM
-----	-----	-----	100	83	47	8	7	7	6	4	NP	NP	A-3 (0)	SP-SM
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	100	96	89	59	50	34	16	11	20	5	A-4 (5)	ML-CL
-----	-----	-----	100	98	95	81	77	66	49	42	49	26	A-7-6 (16)	CL
-----	-----	-----	100	98	95	81	78	68	51	45	57	32	A-7-6 (19)	CH
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	100	95	82	42	34	22	13	8	21	3	A-4 (1)	SM
-----	-----	-----	100	95	84	46	41	31	20	15	18	5	A-4 (2)	SM-SC
-----	-----	-----	100	96	85	49	44	35	23	16	23	10	A-4 (3)	SC
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	100	93	87	54	37	16	8	5	16	2	A-4 (4)	ML
-----	-----	-----	100	95	91	72	60	46	36	32	39	19	A-6 (11)	CL
-----	-----	-----	100	96	92	67	53	37	26	24	34	15	A-6 (8)	CL
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	100	98	94	33	28	18	9	6	NP	NP	A-2-4 (0)	SM
-----	-----	-----	100	99	96	51	45	37	30	28	35	13	A-6 (4)	ML-CL
-----	-----	-----	100	98	93	29	28	24	17	16	25	6	A-2-4 (0)	SM-SC
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	100	99	95	52	45	32	18	10	32	5	A-4 (3)	ML-CL
-----	-----	-----	100	99	95	49	45	35	22	14	17	5	A-4 (3)	SM-SC
-----	-----	-----	100	99	95	58	53	43	29	23	24	10	A-4 (5)	CL
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	100	93	85	33	20	11	7	3	NP	NP	A-2-4 (0)	SM
-----	-----	-----	100	97	92	57	45	35	32	28	37	19	A-6 (8)	CL
-----	-----	-----	100	99	97	65	52	38	35	31	41	21	A-7-6 (11)	CL

the basis of all the material, including that coarser than 2 mm. in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 mm. in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming texture classes for soils.

³ According to the Classification of Soils and Soil-Aggregate Mixtures for Highway Purposes, A. A. S. H. O. Designation: M 145-49.

⁴ According to the Unified Soil Classification System, (13).

- (7) Supplement information obtained from other published maps and reports and aerial photographs, for the purpose of making soil maps and reports that can be readily used by engineers.

The mapping and the descriptive report are somewhat generalized, however, and should be used only in planning more detailed field surveys to determine the in-place condition of the soil at the site of the proposed engineering construction.

Soil Science Terminology

Some of the terms used by the agricultural soil scientist may be unfamiliar to the engineer, and some words—for example, soil, clay, silt, sand, aggregate, and granular—may have special meanings in soil science. Most of these terms, as well as other special terms that are used in the soil survey report, are defined in the glossary. Aggregate and topsoil, which are not included in the glossary, are defined as follows:

Aggregate: A cluster of primary soil particles held together by internal forces to form a clod or fragment.

Topsoil: Presumably fertile soil material used to topdress roadbanks, gardens, and lawns.

Soil Test Data and Engineering Soil Classifications

To be able to make the best use of the soil maps and the soil survey reports, the engineer should know the physical properties of the soil materials and the in-place condition of the soil. After testing soil materials and observing the behavior of soils when used in engineering structures and foundations, the engineer can develop design recommendations for the soil units delineated on the maps.

Soil test data

Soil samples from the principal soil type of each of 11 extensive soil series were tested in accordance with standard procedures (1) to help evaluate the soils for engineering purposes. The test data are given in table 8.

The engineering soil classifications in table 8 are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. Mechanical analyses were made by combined sieve and hydrometer methods. Percentage of clay obtained by the hydrometer method should not be used in naming soil texture classes.

The liquid limit and plastic limit tests measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a solid to semi-solid or plastic state. As the moisture content is further increased, the material changes from the plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from a solid to a plastic state. The liquid limit is the moisture content at which the material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and plastic limit. It indicates the range of

moisture content within which a soil material is in a plastic condition.

Table 8 also gives compaction (moisture-density) data for the tested soils. If a soil material is compacted at successively higher moisture contents, assuming that the compactive effort remains constant, the density of the compacted material will increase until the "optimum moisture content" is reached. After that, the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is termed "maximum dry density." Moisture-density data are important in earthwork, for as a rule optimum stability is obtained if the soil is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

Engineering classification systems

Most highway engineers classify soil materials in accordance with the system approved by the American Association of State Highway Officials (1). In this system, soil materials are classified in seven principal groups. The groups range from A-1, consisting of gravelly soils of high bearing capacity, to A-7, consisting of clay soils having low strength when wet. Within each group, the relative engineering value of the soil material is indicated by a group index number. Group indexes range from 0 for the best materials to 20 for the poorest. The group index number is shown in parentheses, following the soil group symbol, in the next to last column of table 8. The principal characteristics according to which soils are classified in this system are shown in table 9.

Some engineers prefer to use the Unified soil classification system (13). In this system, soil materials are identified as coarse-grained (8 classes), fine-grained (6 classes), or highly organic. The principal characteristics of the 15 classes of soil are given in table 10. The classification of the tested soils according to the Unified system is given in the last column of table 8.

Soil Engineering Data and Recommendations

Some of the engineering information can be obtained from the soil map. It will often be necessary, however, to refer to other sections of the report; particularly to these sections: General Description of the County, Soils of Duplin County, Description of the Soils, and Morphology, Genesis, and Classification of Soils.

The highway soil engineering data and recommendations given in table 11 are based on the soil test data in table 8, information in other sections of the report, and experience with the same kinds of soils in other counties.

The position of the water table and drainage characteristics of the soils are reflected in the suitability ratings of the soils as sources of borrow material for use in embankments. Some soils that have a high water table may be made more suitable for borrow, as well as for roadway excavation, by the construction of drainage ditches before earthwork is started. Underdrains may be required where either a perched or normal water table might cause an unstable soil condition.

Extensive areas of poorly and very poorly drained soils occur in upland depressions, and highly organic material has developed in some of these areas. The thickness of

TABLE 9.—*Classification of soils by American Association of State Highway Officials*¹

General classification	Granular materials (35 percent or less passing No. 200 sieve)								Silt-clay materials (More than 35 percent passing No. 200 sieve)		
	A-1		A-3	A-2				A-4	A-5	A-6	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				
Sieve analysis: Percent passing: No. 10..... No. 40..... No. 200.....	50 maximum. 30 maximum. 15 maximum.	50 maximum. 25 maximum.	51 minimum. 10 maximum.	35 maximum.	35 maximum.	35 maximum.	35 maximum.	36 minimum.	36 minimum.	36 minimum.	
Characteristics of fraction passing No. 40 sieve: Liquid limit.....			NP ² NP	40 maximum. 10 maximum.	41 minimum. 10 maximum.	40 maximum. 11 minimum.	41 minimum. 11 minimum.	40 maximum. 10 maximum.	41 minimum. 10 maximum.	40 maximum. 11 minimum.	
Plasticity index.....	6 maximum.	6 maximum.									
Group index.....	0	0	0	0	0	4 maximum.	4 maximum.	8 maximum.	12 maximum.	16 maximum.	
Usual types of significant constituent materials.	Stone fragments, gravel, and sand.	Stone fragments, gravel, and sand.	Fine sand.	Silty gravel and sand.	Silty gravel and sand.	Clayey gravel and sand.	Clayey gravel and sand.	Nonplastic to moderately plastic silty soils.	Highly elastic silts.	Medium plastic clay.	
General rating as subgrade.	Excellent to good				Fair to poor						

¹ Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Part I): A. A. S. H. O. Designation.
² NP—Nonplastic.
³ Plasticity index of A-7-5 subgroup is equal to or less than LL minus 30. Plasticity index of A-7-6 subgroup is greater than LL minus 30.

TABLE 10.—*Characteristics of soil groups*

Major divisions	Group symbol	Soil description	Value as foundation material ²	Value as base course directly under bituminous pavement
Coarse-grained soils (<i>less than 50 percent passing No. 200 sieve</i>):	GW	Well-graded gravels and gravel-sand mixtures; little or no fines.	Excellent.....	Good.....
Gravels and gravelly soils (<i>more than half of coarse fraction retained on No. 4 sieve</i>).	GP	Poorly graded gravels and gravel-sand mixtures; little or no fines.	Good to excellent....	Poor to fair.....
	GM	Silty gravels and gravel-sand-silt mixtures.	Good.....	Poor to good.....
	GC	Clayey gravels and gravel-sand-clay mixtures.	Good	Poor.....
Sands and sandy soils (<i>more than half of coarse fraction passing No. 4 sieve</i>).	SW	Well-graded sands and gravelly sands; little or no fines.	Good.....	Poor.....
	SP	Poorly graded sands and gravelly sands; little or no fines.	Fair to good.....	Poor to not suitable..
	SM	Silty sands and sand-silt mixtures....	Fair to good.....	Poor to not suitable..
	SC	Clayey sands and sand-clay mixtures..	Fair to good.....	Not suitable.....
Fine-grained soils (<i>more than 50 percent passing No. 200 sieve</i>):	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, and clayey silts of slight plasticity.	Fair to poor.....	Not suitable.....
Silts and clays (<i>liquid limit of 50 or less</i>).	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, and lean clays.	Fair to poor.....	Not suitable.....
	OL	Organic silts and organic clays having low plasticity.	Poor.....	Not suitable.....
	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, and elastic silts.	Poor.....	Not suitable.....
Silts and clays (<i>liquid limit greater than 50</i>).	CH	Inorganic clays having high plasticity and fat clays.	Poor to very poor....	Not suitable.....
	OH	Organic clays having medium to high plasticity and organic silts.	Poor to very poor....	Not suitable.....
Highly organic soils.....	Pt	Peat and other highly organic soils...	Not suitable.....	Not suitable.....

¹ Based on information in The Unified Soil Classification System, Technical Memorandum No. 3-357 (13). Ratings and ranges in test values are for guidance only. Design should be based on field survey and test of samples from construction site.

in Unified soil classification system ¹

Value for embankments	Compaction: Characteristics and recommended equipment	Approximate range in A. A. S. H. O. maximum dry density ³	Field (in-place) CBR	Subgrade modulus k	Drainage characteristics	Comparable groups in A. A. S. H. O. classification
		<i>Lb./cu. ft.</i>		<i>Lb./sq. in./in.</i>		
Very stable; use in pervious shells of dikes and dams.	Good; use crawler-type tractor, pneumatic-tire roller, or steel-wheel roller.	125-135	60-80	300+	Excellent-----	A-1.
Reasonably stable; use in pervious shells of dikes and dams.	Same-----	115-125	25-60	300+	Excellent-----	A-1.
Reasonably stable; not particularly suited to shells, but may be used for impervious cores or blankets.	Good, but needs close control of moisture; use pneumatic-tire or sheepsfoot roller.	120-135	20-80	200-300+	Fair to practically impervious.	A-1 or A-2.
Fairly stable; may be used for impervious core.	Fair, use pneumatic-tire or sheepsfoot roller.	115-130	20-40	200-300	Poor to practically impervious.	A-2.
Very stable; may be used in pervious sections; slope protection required.	Good; use crawler-type tractor or pneumatic-tire roller.	110-130	20-40	200-300	Excellent-----	A-1.
Reasonably stable; may be used in dike section having flat slopes.	Same-----	100-120	10-25	200-300	Excellent-----	A-1 or A-3.
Fairly stable; not particularly suited to shells, but may be used for impervious cores or dikes.	Good, but needs close control of moisture; use pneumatic-tire or sheepsfoot roller.	110-125	10-40	200-300	Fair to practically impervious.	A-1, A-2, or A-4.
Fairly stable; use as impervious core for flood-control structures.	Fair; use pneumatic-tire roller or sheepsfoot roller.	105-125	10-20	200-300	Poor to practically impervious.	A-2, A-4, or A-6.
Poor stability; may be used for embankments if properly controlled.	Good to poor; close control of moisture is essential; use pneumatic-tire or sheepsfoot roller.	95-120	5-15	100-200	Fair to poor-----	A-4, A-5, or A-6.
Stable; use in impervious cores and blankets.	Fair to good; use pneumatic-tire or sheepsfoot roller.	95-120	5-15	100-200	Practically impervious.	A-4, A-6, or A-7.
Not suitable for embankments..	Fair to poor; use sheepsfoot roller. ⁴	80-100	4-8	100-200	Poor-----	A-4, A-5, A-6, or A-7.
Poor stability; use in core of hydraulic fill dam; not desirable in rolled fill construction.	Poor to very poor; use sheepsfoot roller. ⁴	70-95	4-8	100-200	Fair to poor-----	A-5 or A-7.
Fair stability on flat slopes; use in thin cores, blankets, and dike sections of dams.	Fair to poor; use sheepsfoot roller. ⁴	75-105	3-5	50-100	Practically impervious.	A-7.
Not suitable for embankments..	Poor to very poor; use sheepsfoot roller. ⁴	65-100	3-5	50-100	Practically impervious.	A-5 or A-7.
Not used in embankments, dams, or subgrades for pavements-----					Fair to poor-----	None.

² Ratings are for subgrade and subbases for flexible pavement.

³ Determined in accordance with test designation: T 99-49, A. A. S. H. O.

⁴ Pneumatic-tire rollers may be advisable, particularly when moisture content is higher than optimum.

TABLE 11.—*Highway soil engineering*

WELL AND MODERATELY WELL

Soil series	Brief description of ground condition and soil	Dominant slope	Estimated engineering soil classification		Depth to seasonally high water table
			A. A. S. H. O.	Unified	
Caroline.....	½ to 1½ feet of moderately well drained loamy fine sand or sandy loam on fine sandy clay or clay.	<i>Percent</i> 2-12	A-2 or A-4 on A-6 or A-7.	SM or SC on CL or CH.	<i>Feet</i> 4 10+
Craven.....	½ to 1 foot of moderately well drained fine sandy loam on fine sandy clay loam, fine sandy clay, or clay.	0-8	A-2 or A-4 on A-6 or A-7.	SM, SC, or ML on SC, CL, or CH.	6-10
Duplin.....	½ to 1 foot of moderately well drained fine sandy loam on fine sandy clay loam or fine sandy clay.	0-5	A-2 or A-4 on A-6 or A-7.	SM, SC, or ML on SC, CL, or CH.	2
Eustis.....	Well to somewhat excessively drained fine sand; in places has layer of fine sandy loam or fine sandy clay loam at depth of 3 to 3½ feet.	0-5	A-3.....	SP.....	10+
Galestown.....	Well-drained fine sand or loamy sand.....	0-5	A-2 or A-3.....	SP or SM.....	2½
Goldsboro.....	1 to 2½ feet of moderately well drained loamy fine sand or fine sandy loam on fine sandy loam or fine sandy clay loam. Below a depth of 5 feet, the materials are stratified and change in texture from sand to sandy clay.	0-5	A-2 or A-4 on A-2, A-4, or A-6.	SM or SC on SM, SC, or CL.	2
Kenansville.....	2 to 5 feet of well-drained loamy fine sand or fine sandy loam over strata of sand and sandy clay.	0-5	A-2 or A-4 over A-2, A-3, A-4, or A-6.	SM or SC over SP, SM, SC, or CL.	6-10
Klej.....	Moderately well drained fine sand or loamy fine sand.	0-2	A-2 or A-3.....	SP or SM.....	2
Lakeland.....	Well to somewhat excessively drained fine sand; in places a layer of sandy loam or sandy clay loam, more than 6 inches thick, occurs at a depth of 2½ to 3½ feet. In places the material is loamy fine sand at all depths.	0-8	A-3.....	SP.....	10+
Magnolia.....	½ to 2½ feet of well-drained loamy fine sand or fine sandy loam on fine sandy clay to clay loam.	0-8	A-2 or A-4 on A-6..	SM or SC on CL....	10+
Marlboro.....	½ to 1 foot of well-drained fine sandy loam on 3 to 4 feet of fine sandy clay or fine sandy clay loam over stratified sandy or clayey materials.	0-5	A-2 or A-4 on A-6, over A-4 or A-6.	SM, SC, or ML on CL, over SC or CL.	4 10+
Norfolk.....	1 to 2½ feet of well-drained loamy fine sand or fine sandy loam on 3 to 5 feet of fine sandy loam or fine sandy clay loam over stratified sandy or clayey materials.	0-8	A-2 or A-4 on A-4 or A-6, over A-2, A-3, A-4, or A-6.	SM or SC on CL, over SM, SP, SC, or CL.	10+
Ruston.....	1 to 2½ feet of well-drained loamy fine sand or fine sandy loam on 2 to 4 feet of fine sandy clay loam developed from strata of sand, sandy clay, and clayey sand and gravel.	0-12	A-2 or A-4 on A-4 or A-6, over A-2, A-3, A-4, or A-6.	SM or SC on CL, over SM, SP, SC, or CL.	20+
Woodstown.....	½ to 2½ feet of moderately well drained loamy fine sand or fine sandy loam on 2 to 3 feet of fine sandy loam to fine sandy clay developed from strata of sand and sandy clay.	0-5	A-2 or A-4 on A-4 or A-6, over A-2, A-3, A-4, or A-6.	SM or SC on SC or CL, over SP, SM, SC, or CL.	1½

SOMEWHAT POORLY DRAINED

Dragston.....	1 to 2½ feet of fine sandy loam on fine sandy loam or fine sandy clay loam developed from strata of sand and sandy clay.	0-2	A-2 or A-4 on A-4 or A-6, over A-2, A-3, A-4, or A-6.	SM or SC on SM, SC or CL, over SM, SP, SC, or CL.	½-1½
Dunbar.....	½ to 1 foot of fine sandy loam on 1½ to 2½ feet of fine sandy clay loam or clay loam developed from sandy clay.	0-2	A-2 or A-4 on A-4 or A-6, over A-6 or A-7.	SM, SC, or ML on SC or CL over CL or CH.	½-1½
Immokalee.....	Fine sand, with strongly cemented sand (hardpan) layer ranging in thickness from 1 to 10 inches at depth of 1½ to 3½ feet.	0-2	A-3.....	SP.....	4 3

.See footnotes at end of table.

data and recommendations

DRAINED SOILS OF UPLANDS

Recommended location of gradeline	Requirement of porous subbase for rigid (concrete) pavement	Suitability as source of—			
		Vegetative topsoil ¹	Borrow ²	Sand	Sand-clay ³
Anywhere	Possible	Fair to good	Poor	Not suitable	Not suitable.
Anywhere	Possible	Good	Poor	Not suitable	Not suitable.
3 feet minimum above water table.	Possible	Good	Fair	Not suitable	Not suitable.
Anywhere	No	Poor	Good	Fair	Fair to good.
3 feet minimum above water table.	No	Poor	Good	Fair to good	Not suitable.
Same	Possible	Good	Good	Not suitable	Fair to good.
Anywhere	No	Poor to fair	Good	Not suitable	Good.
3 feet minimum above water table.	No	Poor to fair	Good	Fair	Not suitable.
Anywhere	No	Poor	Good	Fair	Not suitable.
Anywhere	Possible	Fair to good	Good	Not suitable	Not suitable.
Anywhere	Possible	Good	Good	Not suitable	Not suitable.
Anywhere	Possible	Fair to good	Good	Not suitable	Good.
Anywhere	Possible	Fair to good	Good	Not suitable	Good.
3 feet minimum above water table.	No	Good	Good	Not suitable	Fair to good.

SOILS OF UPLANDS

3 feet minimum above water table.	No	Fair to good	Fair	Not suitable	Fair to good.
Same	Yes	Fair to good	Fair	Not suitable	Not suitable.
Same	No	Not suitable	Good	Fair to good	Not suitable.

TABLE 11.—*Highway soil engineering*

SOMEWHAT POORLY DRAINED

Soil series	Brief description of ground condition and soil	Dominant slope	Estimated engineering soil classification		Depth to seasonally high water table
			A. A. S. H. O.	Unified	
Lenoir.....	½ to 1 foot of fine sandy loam on 1 to 2½ feet of fine sandy clay with some thin layers of sand or loamy sand; developed from stratified sandy clay or clay.	Percent 0-2	A-2 or A-4 on A-6 or A-7.	SM or SC on CL or CH.	Feet ¼-1½
Lynchburg.....	½ to 2½ feet of fine sandy loam on 1 to 2½ feet of fine sandy loam or fine sandy clay loam developed from stratified sands and sandy clays. In places the surface layer is loamy fine sand.	0-2	A-2 or A-4 on A-4 or A-6, over A-2, A-4, or A-6.	SM or SC on SC or CL, over SM, SC, or CL.	½-1½
Ona.....	Fine sand, slightly cemented with organic matter in layer 2 to 12 inches thick at depth of ½ to 1½ feet.	0-2	A-3.....	SP.....	2

POORLY AND VERY POORLY

Bayboro.....	½ to 1½ feet of very poorly drained highly organic loam or loam, underlain by 1½ to 2 feet of silty clay loam developed from silty clay or clay.	0-2	A-4 or A-5 on A-6 or A-7 over A-6 or A-7.	ML or OL on CL or CH over CL, CH, or MH.	0
Bladen.....	½ to 1½ feet of poorly drained silt loam or fine sandy loam on 1½ to 2 feet of clay to sandy clay loam, or silty clay loam developed from sandy clay, silty clay, or clay.	0-2	A-2 or A-4 on A-4 or A-6, over A-7	SM or ML on SC or CL over CL, CH, or MH.	0
Coxville.....	½ to 1½ feet of poorly drained organic fine sandy loam on fine sandy clay or clay; in places sandy clay loam is at depth of ½ to 2 feet.	0-2	A-2 or A-4 on A-7..	SM, ML, or OL on CL or CH.	0
Fallsington.....	½ to 1½ feet of very poorly drained fine sandy loam on 1½ to 3 feet of fine sandy loam or fine sandy clay loam underlain by stratified sandy clays and sand; in places has layer of sandy clay loam, 1 to 1½ feet thick, at depth of about 8 inches.	0-2	A-2 or A-4 on A-4 or A-6, over A-2, A-3, A-4, or A-6.	SM on SC or CL, over SP, SM, SC, or CL.	½
Leon.....	Fine sand, with one or more layers of strongly cemented to indurated fine sand (hardpan) at depth greater than 12 inches; top hardpan layer is usually 4 or more inches thick.	0-2	A-3.....	SP.....	0-½
Pamlico.....	Organic material, 2 to 5 feet thick over stratified sands, sandy loams, and sandy clay loams.	0-2	A-7-5.....	Pt.....	0
Plummer.....	Very poorly drained fine sand or loamy fine sand.	0-2	A-2 or A-3.....	SM or SP.....	0
Pocomoke.....	½ to 2 feet of very poorly drained highly organic loam on ½ to 2 feet of stratified fine sandy loam or fine sandy clay loam developed from stratified sands and sandy clays; in places the surface layer is muck.	0-2	A-4 or A-5 on A-2, A-4 or A-6, over A-2, A-3, A-4, or A-6.	OL on SM, SC, or CL, over SP, SM, SC, or CL.	0
Portsmouth.....	½ to 2 feet of very poorly drained organic loam on 1½ to 3 feet of fine sandy clay loam developed from sands and sandy clays; in places the surface layer is muck.	0-2	A-4 or A-5 on A-6 or A-7, over A-2, A-3, A-4, or A-6.	SM, ML or OL on SC or CL, over SP, SM, SC or CL.	0
Rains.....	½ to 2½ feet of poorly drained loamy fine sand or fine sandy loam on 1 to 2½ feet of fine sandy clay loam or fine sandy loam developed from stratified sands and sandy clays.	0-2	A-2 or A-4 on A-4 or A-6, over A-2, A-3, A-4, or A-6.	SM or ML on SM, SC or CL, over SP, SM, SC, or CL.	½

See footnotes at end of table.

data and recommendations—Continued

SOILS OF UPLANDS—Continued

Recommended location of gradeline	Requirement of porous subbase for rigid (concrete) pavement	Suitability as source of—			
		Vegetative topsoil ¹	Borrow ²	Sand	Sand-clay ³
3 feet minimum above water table.	Yes.....	Good.....	Poor.....	Not suitable.....	Not suitable.
Same.....	Possible.....	Fair to good.....	Fair.....	Not suitable.....	Poor to fair.
Same.....	No.....	Poor.....	Fair.....	Not suitable.....	Not suitable.

DRAINED SOILS OF THE UPLANDS

3 feet minimum above water table.	Yes.....	Not suitable.....	Not suitable.....	Not suitable.....	Not suitable.
Same.....	Yes.....	Poor to not suitable.	Same.....	Not suitable.....	Not suitable.
Same.....	Yes.....	Poor.....	Same.....	Not suitable.....	Not suitable.
Same.....	Possible.....	Poor.....	Poor.....	Not suitable.....	Poor.
Same.....	No.....	Not suitable.....	Not suitable.....	Fair to good.....	Not suitable.
3 feet minimum above water table. Remove organic layer before making fill.	.....	Not suitable.....	Not suitable.....	Not suitable.....	Not suitable.
Same.....	No.....	Poor to not suitable.	Same.....	Not suitable.....	Not suitable.
Same.....	No.....	Not suitable.....	Same.....	Not suitable.....	Not suitable.
Same.....	Possible.....	Not suitable.....	Same.....	Not suitable.....	Not suitable.
Same.....	Possible.....	Poor.....	Poor.....	Not suitable.....	Poor.

TABLE 11.—Highway soil engineering

POORLY AND VERY POORLY

Soil series	Brief description of ground condition and soil	Dominant slope	Estimated engineering soil classification		Depth to seasonally high water table
			A. A. S. H. O.	Unified	
Rutlege-----	½ to 1½ feet of very poorly drained organic loam or loamy fine sand, with layer of sand cemented with organic matter at depth greater than 3 feet; thickness of cemented layer ranges from 3 to 18 inches and in places is absent; in places the surface layer is mucky loam 1½ to 3 feet in thickness.	Percent 0-2	A-2, A-4 or A-5 on A-2 or A-3.	SM, ML or OL on SP or SM.	Feet 0
St. Johns-----	½ to 1 foot of very poorly drained organic loamy fine sand on fine sand, with layer of sand cemented with organic matter at depth of 1 to 1½ feet; cemented layer ranges up to 12 inches in thickness.	0-2	A-2 on A-3-----	SM on SP-----	0

SOILS OF STREAM

Izagora-----	½ to 1½ feet of moderately well to somewhat poorly drained fine sandy loam on 1 to 1½ feet of fine sandy clay or fine sandy clay loam developed from stratified materials that range in texture from sandy loam to clay (old alluvial material).	0-2	A-2 or A-4 on A-4, A-6; or A-7, over A-2, A-4, A-6, or A-7.	SM, SC, or ML on SC, CL, or CH, over SM, SC, CL, or CH.	0
Kalmia-----	½ to 1½ feet of well-drained fine sandy loam on 1 to 2 feet of fine sandy loam or fine sandy clay loam developed from sandy loam (alluvial deposits).	0-2	A-2 on A-4 or A-6, over A-2, A-4, or A-6.	SM on SC, ML, or CL, over SM, SC, or CL.	10+
Klej-----	Moderately well drained fine sand.	0-2	A-3-----	SP-----	2
Lakeland-----	Well to somewhat excessively drained fine sand; in places a layer of sandy loam or sandy clay loam, more than 6 inches thick, occurs at depth of 2½ to 3½ feet.	0-8	A-3-----	SP-----	4-6
Myatt-----	½ to 1½ feet of poorly drained organic fine sandy loam or loamy fine sand on 1 to 2 feet of fine sandy loam or fine sandy clay loam developed from stratified materials that range in texture from sand to sandy clay loam (old stream alluvium).	0-2	A-2 or A-4 on A-4 or A-6, over A-2, A-3, A-4, or A-6.	SM, SC, ML, or OL on SC or CL, over SP, SM, SC, or CL.	0
Okence-----	1 to 2½ feet of very poorly drained organic loam or fine sandy loam on 1½ to 3 feet of fine sandy loam or fine sandy clay loam developed from stratified materials that range in texture from sand to sandy loam (old alluvium).	0-2	A-2 or A-4 on A-4 or A-6, over A-2, A-3, A-4, or A-6.	SM, SC, ML, or OL on SC or CL, over SP, SM, SC, or CL.	0
Plummer-----	Very poorly drained fine sand or loamy fine sand.	0-2	A-2 or A-3-----	SM or SP-----	0
Stough-----	½ to 2½ feet of somewhat poorly drained, loamy fine sand or fine sandy clay loam on 2 to 3 feet of fine sandy clay loam developed from sandy clay loam or sandy clay (old alluvium).	0-2	A-2 or A-4 on A-4 or A-6, over A-4, A-6, or A-7.	SM or SC on SC or CL, over SC, CL, or CH.	0

See footnotes at end of table.

data and recommendations—Continued

DRAINED SOILS OF THE UPLANDS—Continued

Recommended location of gradeline	Requirement of porous subbase for rigid (concrete) pavement	Suitability as source of—			
		Vegetative topsoil ¹	Borrow ²	Sand	Sand-clay ³
3 feet minimum above water table. Remove organic layer before making fill.	No.....	Not suitable.....	Not suitable.....	Not suitable.....	Not suitable.
Same.....	No.....	Not suitable.....	Same.....	Fair to good.....	Not suitable.

TERRACES

3 feet minimum above water table.	Possible.....	Fair to good.....	Poor.....	Not suitable.....	Poor.
Anywhere.....	Possible.....	Good.....	Good.....	Not suitable.....	Fair to good.
3 feet minimum above water table.	No.....	Poor to fair.....	Good.....	Fair.....	Not suitable.
Same.....	No.....	Poor.....	Good.....	Fair.....	Not suitable.
Same.....	Possible.....	Poor.....	Poor.....	Not suitable.....	Not suitable.
Same.....	Possible.....	Not suitable.....	Not suitable.....	Not suitable.....	Not suitable.
Same.....	No.....	Poor to not suitable.	Same.....	Not suitable.....	Not suitable.
Same.....	Possible.....	Fair to good.....	Poor.....	Not suitable.....	Poor.

TABLE 11.—*Highway soil engineering*

SOILS OF

Soil series	Brief description of ground condition and soil	Dominant slope	Estimated engineering soil classification		Depth to seasonally high water table
			A. A. S. H. O.	Unified	
Johnston.....	1½ to 3 feet of very poorly drained organic loam on stratified materials ranging in texture from fine sandy loam to fine sandy clay loam.	<i>Percent</i> 0-2	A-4 or A-5 on A-2, A-3, A-4, or A-6.	ML or OL on SP, SM, SC, or CL.	<i>Feet</i> 0
Mixed alluvial land, poorly drained.	Poorly drained stratified materials that range in texture from sand to clay loam.	0-2	A-2, A-3, A-4, or A-6.	SP, SM, SC, or CL..	0
Mixed local alluvial land.	1 to 4 feet of somewhat poorly drained stratified materials that range in texture from loamy fine sand to fine sandy loam, over older sediments.	0-2	A-2, A-3, A-4, or A-6.	SP, SM, SC, or CL..	0
Swamp.....	Very poorly drained stratified sand, silt, and clay, with high content of organic matter in places.	0-2	A-2, A-3, A-4, or A-6.	SP, SM, SC, or CL..	0

¹ Rating is for the surface or A-horizon material for use on embankment and cut slopes, and in ditches, to promote the growth of vegetation.

² Rating is for local material suitable for use in embankments or for replacement of unsuitable material.

data and recommendations—Continued

BOTTOM LANDS

Recommended location of gradeline	Requirement of po- rous subbase for rigid (concrete) pavement	Suitability as source of—			
		Vegetative topsoil ¹	Borrow ²	Sand	Sand-clay ³
3 feet minimum above high water.	Yes.....	Not suitable.....	Not suitable.....	Not suitable.....	Not suitable.
Same.....	Possible.....	Poor to not suit- able.	Same.....	Not suitable.....	Not suitable.
Same.....	Possible.....	Same.....	Poor to not suit- able.	Not suitable.....	Not suitable.
Same.....	Yes.....	Not suitable.....	Not suitable.....	Not suitable.....	Not suitable.

³ Rating is for soil type base course for flexible pavement; the addition of another soil material to improve the gradation or plasticity characteristics may be necessary.

⁴ Perched water table occurs at a depth of about 2 feet.

TABLE 12.—*Hazards to open-ditch and tile-drainage systems and to farm ponds*

WELL DRAINED AND MODERATELY WELL DRAINED SOILS

Topographic position and soil series	Drainage system		Farm ponds	
	Open ditch	Tile		
Soils of uplands:	<i>Hazard</i>	<i>Hazard</i>	<i>Kind</i>	<i>Hazard</i>
Caroline.....			Impounded.....	
Craven.....			Impounded.....	
Duplin.....			Impounded and excavated.	
Eustis.....			Impounded.....	
Galestown.....			Impounded.....	Sand.
Goldsboro.....			Impounded and excavated.	Sand.
Kenansville.....			Impounded.....	Sand strata.
Klej.....	Caving and flowing sand.	Sand.....	Impounded and excavated.	Sand.
Lakeland.....			Impounded.....	Sand.
Magnolia.....			Impounded.....	
Marlboro.....			Impounded.....	
Norfolk.....			Impounded.....	
Ruston.....			Impounded.....	
Woodstown.....	Caving.....	Sand substrata.....	Impounded and excavated.	Sand substrata.

SOMEWHAT POORLY DRAINED SOILS

Dragston.....	Caving.....	Sand substrata.....	Excavated.....	Sand substrata.
Dunbar.....			Excavated and impounded.	
Immokalee.....	Caving.....	Sand.....	Excavated.....	Sand.
Lenoir.....		Slowly permeable.....	Excavated and impounded.	
Lynchburg.....			Excavated.....	
Ona.....	Caving.....	Sand.....	Excavated.....	Sand.

POORLY AND VERY POORLY DRAINED SOILS

Bayboro.....		Slowly permeable.....	Excavated.....	
Bladen.....		Slowly permeable.....	Excavated.....	
Coxville.....			Excavated.....	
Fallsington.....	Caving, flowing sand.....	Sand substrata.....	Excavated.....	
Leon.....	Hardpan, sand.....	Hardpan, sand.....	Excavated.....	Sand.
Pamlico.....				
Plummer.....	Caving, flowing sand.....	Sand.....	Excavated.....	Sand.
Pocomoke.....	Caving, flowing sand.....	Sand substrata.....	Excavated.....	
Portsmouth.....			Excavated.....	
Rains.....			Excavated.....	
Rutlege.....	Caving, flowing sand.....	Sand.....	Excavated.....	Sand.
St. Johns.....	Hardpan, sand.....	Hardpan, sand.....	Excavated.....	Sand.

WELL DRAINED TO VERY POORLY DRAINED SOILS

Soils of stream terraces:				
Izagora.....			Excavated.....	Possible overflow.
Kalmia.....			Impounded.....	Sand.
Klej (terrace phase).....	Caving, flowing sand.....	Sand.....	Excavated.....	Possible overflow.
Lakeland (terrace phase).....			Impounded.....	Sand.
Myatt.....	Caving, flowing sand.....	Sand substrata.....	Excavated.....	Sand substrata, possible overflow.
Okenee.....	Caving, flowing sand.....	Sand substrata.....	Excavated.....	Sand substrata, possible overflow.
Plummer (terrace phase).....	Caving, flowing sand.....	Sand substrata.....	Excavated.....	Sand, possible overflow.
Stough.....			Excavated.....	Possible overflow.

SOMEWHAT POORLY DRAINED TO VERY POORLY DRAINED SOILS

Soils of bottom lands:				
Johnston.....	Caving, overflow.....		Impounded and excavated.	Sand, overflow.
Mixed alluvial land, poorly drained.....	Caving, overflow.....		Impounded and excavated.	Sand, overflow.
Mixed local alluvial land.....	Caving, overflow.....		Impounded and excavated.	Sand, overflow.
Swamp.....	Unclassified soil material.....			

the highly organic layer of Pamlico muck may be as great as 5 feet, whereas that of the associated Bayboro, Pocomoke, Portsmouth, and Rutledge soils is usually not greater than 2 feet. This highly organic material should be removed from the roadway section and placed where it will not be detrimental to road structures. Roads should be built on embankments in these depressed areas so that the pavement surface is at least 3 feet above the water table.

The lower parts of the bottom lands may be flooded each year. A roadway in these lowlands should be constructed on a continuous embankment that extends above high-water level.

Earthwork in the well and moderately well drained sandy soils of the upland and terraces is usually possible during the winter, provided the required standards of construction with respect to compaction of soils are maintained. Earthwork in the moderately well drained Duplin, Goldsboro, and Woodstown soils of the upland and in the more poorly drained clayey soils of the bottom land, terraces, and upland will be difficult when the water table is high and during prolonged wet periods.

Some of the clean sands that occur in upland areas where the water table is deep—for example, the Eustis and Lakeland soils—are susceptible to wind erosion when they are exposed in roadway cuts.

It is generally considered that repeated movements of heavy-axle trucks over a rigid pavement that has been constructed on a subgrade composed of a soil material of which more than 35 percent passes the No. 200 sieve (0.074 mm. openings) will cause the forceful ejection of the subgrade soil and water. Table 11 shows the soils that need to be covered with a porous subbase to prevent the pumping action. "Possible" means that a project soil survey will be needed to determine whether a subbase is needed.

Ratings are given in table 11 for suitability of the soils of Duplin County as sources of topsoil for use on embankment, ditch, and cut slopes and in shoulders of highways, to promote the growth of vegetation. Sandy loams are preferred on shoulders that are to support limited traffic. Ratings are also given in this table for suitability of the soils as sources of sand for (1) use in subgrade reinforcement and (2) for mixing with another soil material that is to be used in a soil type base course. Material in some locations may be suitable for use in a sand-asphalt base course. The ratings given for suitability of the soils as sources of sand-clay are for use in soil-type base courses for flexible pavements. The addition of sand to improve the gradation or plasticity characteristics may be necessary.

Drainage Systems and Farm Ponds

Draining wet cropland and constructing farm ponds

are some of the important practices of conservation farming. The chief hazards affecting open ditches, tile drains, and the construction of ponds are summarized for the soil series in table 12.

Open ditches.—Hardpans in soils limit the depth and spacing of ditches and increase the costs of construction. Overflows from outside sources tend to fill ditches and increase the costs of maintenance. If the overflow is of high velocity, ditches in cultivated fields may fill during a single storm.

In sandy soils, uniform side slopes are hard to maintain along ditch banks and may have to be of very low gradient. Flowing sands cause bank caving and increase the difficulty of excavating ditches. Construction may be limited to the dry season, or a line of tile may have to be laid in the sandy layer to intercept the water.

Tile drainage systems.—Tiles must be placed at less depth and closer together in slowly permeable soils than in soils of more open texture. Careful installation, good management, and time are required to obtain full effectiveness of a tile system in fine-textured soils. Use of tile in very tight soils may not be feasible because of the very close spacing needed.

In sandy soils, the caving of ditch banks is a problem while the tile is being laid. Some strata of sandy soils are so unstable that tile is difficult to keep in proper alignment during installation. Joints must be wrapped to hold sand out of the tiles.

Farm ponds.—Ponds excavated in wet sands or in sandy substrata may need side slopes more nearly flat than normal. In addition, spoil banks may need to be spread, or extra wide berms used. Sand alone is a poor fill material for dams. There is danger of excess seepage through the base of the dam or into the underlying formation. Sand strata may cause excess seepage.

Ponds excavated in areas subject to overflow are apt to be filled with sediment and to require excessive maintenance.

Detailed Soils Investigations for Earth Construction

At many construction sites, major variations in the soil may occur within the depth of the proposed excavation, and several soil units may occur within a short distance. The soil map and profile descriptions, as well as the engineering data and recommendations given in this section, should be used in planning detailed surveys of soils at construction sites. By using the information in the soil survey reports, the soils engineer can concentrate on the most important soil units. Then, a minimum number of soil samples will be obtained for laboratory testing, and an adequate soil investigation can be made at minimum cost.

Glossary

(Most of the definitions in this glossary were taken from *Soils and Men (11)* or from the *Soil Survey Manual (12)*)

Acidity. The degree of acidity of the soil mass expressed in pH values, or in words, as follows:

Extremely acid.....	below 4.5
Very strongly acid.....	4.5-5.0
Strongly acid.....	5.1-5.5
Medium acid.....	5.6-6.0
Slightly acid.....	6.1-6.5
Neutral.....	6.6-7.3
Mildly alkaline.....	7.4-7.8
Moderately alkaline.....	7.9-8.4
Strongly alkaline.....	8.5-9.0
Very strongly alkaline.....	9.1 and higher

Alluvium. Fine material such as sand, silt, or clay, deposited on land by streams.

Clay. Small mineral soil grains, less than 0.002 mm. in diameter.

Colluvium. Deposits of rock fragments and soil material accumulated at the base of slopes through the influence of gravity; includes creep and local wash.

Consistence. Degree of cohesion and resistance to forces tending to deform or rupture the aggregate. The relative mutual attraction of the particles in the whole mass, or their resistance to separation. The following terms are commonly used to describe consistence.

Brittle. Breaking with a sharp, clean fracture when dry, or shattering into cleanly broken hard fragments if struck a sharp blow.

Claypan. Compact horizons or layers rich in clay and separated more or less abruptly from the overlying horizon; hard when dry and plastic or stiff when wet.

Compact. Dense and firm but without any cementation.

Firm. Resistant to forces tending to produce rupture or deformation.

Friable. Easily crumbled by the fingers; nonplastic.

Impervious. Very resistant to penetration by water and usually by air and plant roots; impenetrable.

Plastic. Readily molded or modeled without rupture; puttylike.

Sticky. Adhesive when wet, but cohesive when dry; shows tendency to adhere to other material and objects.

Stiff. Resistant to deformation or rupture; firm and tenacious and tending toward imperviousness. Usually applied to condition of the soil in place and moderately wet.

Tight. Compact, impervious, tenacious, and usually plastic.

Contour tillage. Furrows plowed at right angles to the direction of slope, at the same level throughout, and ordinarily at comparatively close intervals.

Cropland. Land regularly used for crops, except forest crops. It includes rotation pasture, cultivated summer fallow, or other land ordinarily used for crops but temporarily idle.

Crumb. Generally soft, small, porous aggregates, irregular but tending toward a spherical shape, as in the A₁ horizons of many soils. Crumb structure is closely related to granular structure.

Erosion. The wearing away or removal of soil material by water or wind.

Fertility. The inherent qualities that enable a soil to sustain plant growth.

First bottom. The normal flood plain of a stream; land along a stream that is subject to overflow.

Forest. Land not in farms that bears a stand of trees of any age or stature, including seedlings (reproduction), but of species attaining a minimum average height of 6 feet at maturity, or land from which such a stand has been removed, but is not now restocking, and on which no other use has been substituted. Forest on farms is called farm woodland or farm forest.

Genesis, soil. Mode of origin of the soil, referring particularly to the processes responsible for the development of the solum from the unconsolidated parent material.

Granular. Roughly spherical firm small aggregates that may be either hard or soft but that are usually more firm than crumb; without the distinct faces of blocky structure.

Great soil group. A broad group of soils having common internal soil characteristics. It includes one or more families of soils.

Green-manure crop. Any crop grown and plowed under for the purpose of improving the soil, especially by the addition of organic matter.

Horizon, soil. A layer of soil, approximately parallel to the soil surface, and having characteristics produced by soil-forming processes.

Horizon A. The upper layer of the soil mass, from which material has been removed by percolating water; the eluviated part of the solum; the surface soil. It is generally divided into two or more subhorizons; A₀, which is not a part of the mineral soil, but the accumulations of organic debris on the surface; and the other subhorizons designated as A₁, A₂, and so on.

Horizon B. The layer of deposition, to which materials have been added by percolating water; the illuviated part of the solum; the subsoil. This horizon may also be divided into several subhorizons, depending on color, structure, consistence, or the character of the material deposited, and designated as B₁, B₂, B₃, and so on.

Horizon C. The layer of partly weathered material underlying the B horizon; the substratum; usually part of the parent material.

Horizon D. Any stratum underlying the C, or the B if no C is present, which is unlike C, or unlike the material from which the solum has been formed.

Horizon G. A soil horizon in which the material ordinarily is bluish gray or olive gray, more or less sticky, compact, and often structureless.

Internal drainage. Downward flow of excess water through the soil. It is affected by the texture and structure, by other characteristics of the soil and underlying layers, and by the height of the water table, either permanent or perched. Relative terms for expressing internal drainage are very rapid, rapid, medium, slow, very slow, and none.

Leaching, soil. Downward movement of materials in solution.

Massive. Large uniform masses of cohesive soil, sometimes with ill-defined and irregular cleavage, as in some of the fine-textured alluvial soils; structureless.

Morphology. The physical constitution of the soil, including the texture, structure, porosity, consistence, and color of the various soil horizons, their thickness, and their arrangement in the soil profile.

Mottling. Containing irregular spots of different colors.

Natural drainage. Conditions that existed during the development of the soil; opposed to altered drainage, which is usually the result of artificial drainage or irrigation but may be due to natural deepening of channels or filling of depressions. The following terms are used to express natural drainage: Excessively drained, somewhat excessively drained, well drained, moderately well drained, imperfectly or somewhat poorly drained, poorly drained, and very poorly drained.

Normal soil. A soil having a profile in equilibrium or nearly in equilibrium with its environment, developed under a good but not excessive drainage from parent material of mixed mineralogical, physical, and chemical composition, and expressing the full effects of the forces of climate and living matter.

Nutrients, plant. The elements taken in by the plant, essential to its growth, and used by it in the elaboration of its food and tissue. These include nitrogen, phosphorus, calcium, potassium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps others obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Parent material. The unconsolidated mass from which the soil profile develops.

Permeable. Easily penetrated by water.

Productivity. The ability of a soil to produce a specified plant or sequence of plants under a system of management. A response to management.

Profile, soil. A vertical section from the surface into the parent material.

Relief. The elevations or inequalities of a land surface, considered collectively.

Sand. Small rock or mineral fragments ranging in diameter from 0.05 mm. to 2.0 mm. The term "sand" is also applied to soils containing 90 percent or more of sand.

Silt. Small grains of mineral soil ranging in diameter from 0.05 mm. to 0.002 mm.

Single grain. Each grain taken alone, as in sand; structureless.

Soil. The natural medium for the growth of land plants on the surface of the earth; composed of organic and mineral material.

Structure, soil. The aggregation of primary soil particles into compound particles or clusters of primary particles, which are separated from adjoining aggregates by surface of weakness.

Subsoil. Technically, the B horizon; roughly, that part of the profile below plow depth.

Substratum. Material underlying the subsoil.

Surface runoff. Water removed by flow over the surface of the soil; amount and rapidity of surface runoff are affected by texture, structure, and porosity of the surface soil, climate, cover, and slope. Relative degree of surface runoff is expressed by the terms "very rapid," "rapid," "medium," "slow," "very slow," and "ponded".

Surface soil. Technically, the A horizon; commonly, the part of the upper profile usually stirred by plowing.

Terrace (Geologic). An old alluvial plain, usually level or smooth, bordering a stream, a lake, or the sea; frequently called a second bottom as contrasted to a flood plain; seldom subject to overflow. Also (marine terrace) a land surface formed by the breaking of waves on a shore or the sweeping of currents in a body of water. The land surface of Duplin County is made up of four marine terraces that are described under Physiography, Relief, and Drainage, and there are also later alluvial terraces along the streams.

Texture. Size of the individual particles making up the soil mass; the proportions of sand, silt, and clay particles less than 2 mm. in diameter. A coarse-textured soil is one high in content of sand; a fine-textured one has a large proportion of clay.

Upland (Geologic). Land consisting of material unworked by water in recent geologic time and lying in general at higher elevations than the alluvial plain or stream terrace.

Literature Cited

- (1) AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS.
1955. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING, ed. 7, 2 v. Washington, D. C.
- (2) CLARK, WM. B., JOHNSON, B. L., MILLER, B. L., and others.
1912. THE COASTAL PLAIN OF NORTH CAROLINA. N. C. Geol. and Econ. Survey (Rpt.) 3, 552 pp., illus.
- (3) CRUIKSHANK, J. W.
1940. FOREST RESOURCES OF THE SOUTHERN COASTAL PLAIN OF NORTH CAROLINA. U. S. Dept. Agr., For. Serv., Forest Survey Release No. 4. 46 pp., illus.
- (4) DE MOTTS, G., and SWANSON, D.
1951. SHOULD FARMERS GAMBLE WITH FROST. N. C. Agr. Expt., Sta., Spec. Cir. No. 13. [8 pp.], illus.
- (5) MUNDORFF, C. H.
1945. PROGRESS REPORT ON GROUND WATER. N. C. Dept. Conserv. and Developmt., Div. Min. Resources. Bul. 47, 78 pp.
- (6) NEWSOME, A. R.
1928. TWELVE NORTH CAROLINA COUNTIES IN 1810-1811. N. C. Hist. Rev. 5: 413-446.
- (7) NORTH CAROLINA STATE BOARD OF AGRICULTURE, comp. by.
1923. NORTH CAROLINA THE LAND OF OPPORTUNITY. 348 pp., illus. Raleigh, N. C.
- (8) PROUTY, W. F.
1952. CAROLINA BAYS AND THEIR ORIGIN. Geol. Soc. Amer. Bul. 15: 167-224, illus.
- (9) ROOT, A. S., and HURST, L. A.
1905. SOIL SURVEY OF DUPLIN COUNTY, NORTH CAROLINA. U. S. Dept. Agr., Bur. Soils. 23 pp., illus.
- (10) THORP, JAMES, and SMITH, GUY D.
1949. HIGHER CATEGORIES OF SOIL CLASSIFICATION: order, sub-order, and great soil group. Soil Sci. 67: 117-126.
- (11) UNITED STATES DEPARTMENT OF AGRICULTURE.
1938. SOILS AND MEN. U. S. Dept. Agr. Ybk. 1938: 1232 pp., illus.
- (12) ———
1951. SOIL SURVEY MANUAL. U. S. Dept. Agr. Handbook No. 18, 503 pp., illus.
- (13) WATERWAYS EXPERIMENT STATION.
1953. UNIFIED SOIL CLASSIFICATION SYSTEM. 3 v., Corps of Engin., U. S. Army, Tech. Memo. No. 3-357. Prepared for Off., Chief of Engin., Vicksburg, Miss.
- (14) WORKS PROJECT ADMINISTRATION.
1939. NORTH CAROLINA, A GUIDE TO THE OLD NORTH STATE. Federal Writers Project, Amer. Guide Ser., 601., illus. Chapel Hill, N. C.

SOILS OF DUPLIN COUNTY, NORTH CAROLINA:

Soil	Map symbol	Topographic position	Dominant slope	Parent material	Internal drainage
Bayboro loam.....	Ba	Upland.....	0-2	Silty clay or clay.....	Slow.....
Bladen silt loam.....	Bc	Upland.....	0-2	Silty clay or clay.....	Slow.....
Bladen fine sandy loam.....	Bb	Upland.....	0-2	Silty clay or clay.....	Slow to very slow.....
Caroline fine sandy loam:					
Gently sloping phase.....	Ca	Upland; stream breaks and marine terrace escarpments.	2-5	Fine sandy clay or clay.....	Slow.....
Eroded gently sloping phase.....	Cb	Same.....	2-5	Fine sandy clay or clay.....	Slow.....
Sloping phase.....	Cc	Same.....	5-8	Fine sandy clay or clay.....	Slow.....
Eroded sloping phase.....	Cd	Same.....	5-8	Fine sandy clay or clay.....	Slow.....
Strongly sloping phase.....	Ce	Stream breaks and escarpments.	8-12	Fine sandy clay or clay.....	Slow.....
Caroline-Lakeland complex:					
Gently sloping phases.....	Cf	Upland; near stream breaks and escarpments.	2-5	Mixed sands and clays.....	Slow to very rapid.....
Sloping phases.....	Cg	Same.....	5-8	Mixed sands and clays.....	Slow to very rapid.....
Strongly sloping phases.....	Ch	Stream breaks and escarpments.	8-12	Mixed sands and clays.....	Slow to very rapid.....
Coxville fine sandy loam.....	Ck	Upland; interstream flats.....	0-2	Fine sandy clay or clay.....	Slow to very slow.....
Sandy clay subsoil phase.....	Cm	Upland; interstream flats.....	0-2	Sandy clay.....	Slow.....
Craven fine sandy loam:					
Nearly level phase.....	Cn	Upland.....	0-2	Fine sandy clay or clay.....	Slow.....
Gently sloping phase.....	Co	Upland.....	2-5	Fine sandy clay or clay.....	Slow.....
Eroded gently sloping phase.....	Cp	Upland.....	2-5	Fine sandy clay or clay.....	Slow.....
Eroded sloping phase.....	Cr	Stream breaks and escarpments.	5-8	Fine sandy clay or clay.....	Slow.....
Dragston fine sandy loam.....	Da	Upland.....	0-2	Sands and sandy clays.....	Medium to slow.....
Dragston loamy fine sand, thick surface phase.....	Db	Upland.....	0-2	Sands and sandy clays.....	Medium to slow.....
Dunbar fine sandy loam.....	Dc	Upland.....	0-2	Sandy clay.....	Medium.....
Duplin fine sandy loam:					
Nearly level phase.....	Dd	Broad interstream uplands.....	0-2	Sandy clay.....	Medium to slow.....
Gently sloping phase.....	De	Upland.....	2-5	Sandy clay.....	Medium to slow.....
Eustis loamy fine sand:					
Nearly level phase.....	Ea	Upland.....	0-2	Sands.....	Rapid.....
Gently sloping phase.....	Eb	Upland.....	2-5	Sands.....	Rapid.....
Fallsington fine sandy loam.....	Fa	Upland.....	0-2	Sands and sandy clays.....	Slow.....
Galestown fine sand:					
Nearly level phase.....	Ga	Upland.....	0-2	Sands.....	Very rapid.....
Gently sloping phase.....	Gb	Upland.....	2-5	Sands.....	Very rapid.....
Goldsboro fine sandy loam:					
Nearly level phase.....	Gc	Upland.....	0-2	Sand and sandy clays.....	Medium.....
Gently sloping phase.....	Gd	Upland.....	2-5	Sand and sandy clays.....	Medium.....
Goldsboro loamy fine sand:					
Nearly level thick surface phase.....	Ge	Upland.....	0-2	Sand and sandy clays.....	Medium.....
Gently sloping thick surface phase.....	Gf	Upland.....	2-5	Sand and sandy clays.....	Medium.....
Immokalee fine sand.....	Ia	Upland.....	0-2	Sands.....	Slow.....
Izadora fine sandy loam.....	Ib	Stream terrace.....	0-2	Old alluvium.....	Slow.....
Johnston loam.....	Ja	First bottom.....	0-2	Recent alluvium.....	Slow.....
Kalmia fine sandy loam.....	Ka	Stream terrace.....	0-2	Old alluvium.....	Medium.....
Kenansville fine sandy loam:					
Nearly level phase.....	Kb	Upland.....	0-2	Sands and sandy clays.....	Rapid.....
Gently sloping phase.....	Kc	Upland.....	2-5	Sands and sandy clays.....	Rapid.....
Kenansville loamy fine sand:					
Nearly level thick surface phase.....	Kd	Upland.....	0-2	Sands and sandy clays.....	Rapid.....
Gently sloping thick surface phase.....	Ke	Upland.....	2-5	Sands and sandy clays.....	Rapid.....
Klej fine sand.....	Kf	Upland.....	0-2	Sands.....	Medium to rapid.....
Klej fine sand, terrace phase.....	Kg	Stream terrace.....	0-2	Old sandy alluvium.....	Medium to rapid.....
Klej loamy fine sand.....	Kh	Upland.....	0-2	Sands.....	Slow to medium.....
Lakeland fine sand:					
Nearly level phase.....	La	Upland.....	0-2	Sands.....	Very rapid.....
Gently sloping phase.....	Lb	Upland.....	2-5	Sands.....	Very rapid.....
Sloping phase.....	Lc	Upland.....	5-8	Sands.....	Very rapid.....
Strongly sloping phase.....	Ld	Narrow ridges and escarpments.	8-12	Sands.....	Very rapid.....

SUMMARY OF IMPORTANT CHARACTERISTICS

Surface soil			Subsoil		Land capability unit
Color	Consistence	Range in thickness	Color	Consistence	
		<i>Inches</i>			
Black.....	Friable.....	6-20	Gray.....	Plastic.....	IVw-3.
Dark gray.....	Firm.....	6-14	Dark gray and gray.....	Plastic.....	IVw-3.
Dark gray.....	Friable.....	10-20	Dark gray.....	Plastic.....	IIIw-2.
Dark gray.....	Friable.....	8-18	Strong brown, red, and gray.....	Firm.....	IIIe-2.
Dark grayish brown.....	Firm.....	0-8	Same.....	Firm.....	IIIe-2.
Dark gray.....	Friable.....	8-18	Same.....	Firm.....	IIIe-2.
Dark grayish brown.....	Firm.....	0-8	Same.....	Firm.....	IIIe-2.
Dark gray.....	Friable.....	8-14	Same.....	Firm.....	IVe-1.
Dark gray to strong brown and red.....	Loose to firm.....	0-42+	Pale yellow to strong brown and red.....	Loose to firm.....	IIIs-1.
Same.....	Loose to firm.....	0-42+	Same.....	Loose to firm.....	IIIs-1.
Same.....	Loose to firm.....	0-42+	Same.....	Loose to firm.....	VIIIs-1.
Dark gray.....	Friable to firm.....	4-16	Grayish brown.....	Very firm.....	IIIw-2.
Gray.....	Friable.....	8-12	Gray and light brownish gray.....	Firm.....	IIw-3.
Grayish brown.....	Friable.....	6-14	Brownish yellow.....	Firm.....	IIw-1.
Grayish brown.....	Friable.....	6-14	Brownish yellow.....	Firm.....	IIIe-2.
Light brownish gray to yellowish brown.....	Friable to firm.....	0-6	Brownish yellow.....	Firm.....	IIIe-2.
Same.....	Friable to firm.....	0-6	Brownish yellow.....	Firm.....	IIIe-2.
Very dark grayish brown.....	Friable.....	12-18	Brownish yellow and gray.....	Friable.....	IIIw-1.
Same.....	Friable.....	18-30	Same.....	Friable.....	IIIw-1.
Dark gray.....	Friable.....	8-12	Same.....	Firm.....	IIw-2.
Light brownish gray.....	Friable.....	6-14	Yellowish brown.....	Friable to firm.....	IIw-1.
Same.....	Friable.....	7-12	Yellowish brown.....	Friable to firm.....	IIe-2.
Grayish brown.....	Loose.....	36-42	Reddish yellow.....	Loose.....	IIIs-1.
Grayish brown.....	Loose.....	36-42	Reddish yellow.....	Loose.....	IIIs-1.
Very dark gray.....	Friable.....	8-18	Gray.....	Friable.....	IIIw-3.
Brown.....	Loose.....	24-36	Brownish yellow to yellowish brown.....	Loose.....	IVs-1.
Brown.....	Loose.....	24-36	Same.....	Loose.....	IVs-1.
Very dark gray.....	Friable.....	8-18	Light olive brown.....	Friable to firm.....	IIw-1.
Very dark gray.....	Friable.....	12-18	Light olive brown.....	Friable to firm.....	IIe-2.
Very dark gray.....	Friable.....	18-30	Light olive brown.....	Friable to firm.....	IIs-1.
Very dark gray.....	Friable.....	18-30	Light olive brown.....	Friable to firm.....	IIs-1.
White.....	Loose.....	20-38	Dark brown to brown.....	Cemented.....	IVw-2.
Very dark gray.....	Friable.....	6-18	Olive brown.....	Firm.....	IIw-2.
Black.....	Friable.....	18-36	Very dark gray.....	Friable.....	IVw-1.
Dark grayish brown.....	Friable.....	6-18	Yellowish brown.....	Friable.....	I-1.
Grayish yellow and light gray.....	Friable.....	10-18	Yellowish brown.....	Friable.....	IIs-1.
Same.....	Friable.....	10-18	Yellowish brown.....	Friable.....	IIs-1.
Same.....	Very friable.....	18-30	Yellowish brown.....	Friable.....	IIIs-1.
Same.....	Very friable.....	18-30	Yellowish brown.....	Friable.....	IIIs-1.
Very dark gray.....	Loose.....	24-30	Light yellowish brown.....	Loose.....	IVw-2.
Dark grayish brown.....	Loose.....	24-36	Brown.....	Loose.....	IVw-2.
Very dark gray.....	Loose.....	24-30	Light yellowish brown.....	Very friable.....	IIIw-3.
Very dark gray.....	Loose.....	36-44	Pale yellow.....	Loose.....	IVs-1.
Very dark gray.....	Loose.....	36-44	Pale yellow.....	Loose.....	IVs-1.
Very dark gray.....	Loose.....	36-44	Pale yellow.....	Loose.....	IVs-1.
Very dark gray.....	Loose.....	42+	Pale yellow.....	Loose.....	VIIIs-1.

SOILS OF DUPLIN COUNTY, NORTH CAROLINA:

Soil	Map sym- bol	Topographic position	Domi- nant slope	Parent material	Internal drainage
Lakeland fine sand—Continued					
Nearly level shallow phase.....	Le	Upland.....	0-2	Sands.....	Medium to rapid.....
Gently sloping shallow phase.....	Lf	Upland.....	2-5	Sands.....	Medium to rapid.....
Sloping shallow phase.....	Lg	Upland.....	5-8	Sands.....	Medium to rapid.....
Terrace phase.....	Lh	Stream terrace.....	0-2	Old sandy alluvium.....	Very rapid.....
Lakeland loamy fine sand:					
Nearly level phase.....	Lk	Upland.....	0-2	Sands.....	Rapid.....
Gently sloping phase.....	Lm	Upland.....	2-5	Sands.....	Rapid.....
Lenoir fine sandy loam.....	Ln	Upland flats and depressions.....	0-2	Fine sandy clay or clay.....	Slow.....
Leon fine sand.....	Lo	Upland.....	0-2	Sands.....	Slow.....
Lynchburg fine sandy loam.....	Lp	Upland.....	0-2	Sands and sandy clays.....	Slow to very slow.....
Lynchburg loamy fine sand, thick surface phase.....	Lr	Upland.....	0-2	Sands and sandy clays.....	Slow.....
Magnolia loamy fine sand:					
Nearly level thick surface phase.....	Mc	Upland.....	0-2	Sandy clays.....	Medium.....
Gently sloping thick surface phase.....	Md	Upland.....	2-5	Sandy clays.....	Medium.....
Magnolia fine sandy loam:					
Eroded gently sloping phase.....	Ma	Upland.....	2-5	Sandy clays.....	Medium.....
Eroded sloping phase.....	Mb	Upland; stream breaks.....	5-8	Sandy clays.....	Medium.....
Marlboro fine sandy loam:					
Nearly level phase.....	Me	Upland.....	0-2	Sandy clays.....	Medium.....
Gently sloping phase.....	Mf	Upland.....	2-5	Sandy clays.....	Medium.....
Eroded gently sloping phase.....	Mg	Upland.....	2-5	Sandy clays.....	Medium.....
Mixed alluvial land, poorly drained.....	Mh	First bottom.....	0-2	Recent alluvium.....	Very slow.....
Mixed local alluvial land.....	Mk	Base of slopes.....	0-2	Local alluvium.....	Medium to rapid.....
Myatt fine sandy loam.....	Mm	Stream terrace.....	0-2	Old alluvium.....	Slow to very slow.....
Myatt loamy fine sand.....	Mn	Stream terrace.....	0-2	Old alluvium.....	Slow to very slow.....
Norfolk fine sandy loam:					
Nearly level phase.....	Na	Upland.....	0-2	Sands and sandy clays.....	Medium.....
Gently sloping phase.....	Nb	Upland.....	2-5	Sands and sandy clays.....	Medium.....
Eroded gently sloping phase.....	Nc	Upland.....	2-5	Sands and sandy clays.....	Medium.....
Sloping phase.....	Nd	Upland.....	5-8	Sands and sandy clays.....	Medium.....
Eroded sloping phase.....	Ne	Upland.....	5-8	Sands and sandy clays.....	Medium.....
Norfolk loamy fine sand:					
Nearly level thick surface phase.....	Nf	Upland.....	0-2	Sands and sandy clays.....	Medium.....
Gently sloping thick surface phase.....	Ng	Upland.....	2-5	Sands and sandy clays.....	Medium.....
Sloping thick surface phase.....	Nh	Escarpments and ridges.....	5-8	Sands and sandy clays.....	Medium.....
Okenece loam.....	Ob	Stream terrace.....	0-2	Old alluvium.....	Slow.....
Okenece fine sandy loam.....	Oa	Stream terrace.....	0-2	Old alluvium.....	Slow.....
Ona fine sand.....	Oc	Upland.....	0-2	Sands.....	Slow.....
Ona loamy fine sand.....	Od	Upland.....	0-2	Sands.....	Slow.....
Pamlico muck.....	Pa	Upland swamps and bays.....	0-2	Plant residue.....	Very slow.....
Shallow phase.....	Pb	Upland swamps and bays.....	0-2	Plant residue.....	Very slow.....
Plummer fine sand.....	Pc	Upland.....	0-2	Sands.....	Slow.....
Terrace phase.....	Pd	Stream terrace.....	0-2	Old alluvium.....	Slow.....
Plummer loamy fine sand.....	Pe	Upland.....	0-2	Sands.....	Slow.....
Pocomoke loam.....	Pf	Upland.....	0-2	Sands and sandy clays.....	Slow to very slow.....
Portsmouth loam.....	Pg	Upland or in bays.....	0-2	Sands and sandy clays.....	Slow to very slow.....
Portsmouth mucky loam.....	Ph	Upland or in bays.....	0-2	Sands and sandy clays.....	Slow to very slow.....
Rains fine sandy loam.....	Ra	Upland.....	0-2	Sands and sandy clays.....	Slow to very slow.....
Rains loamy fine sand, thick surface phase.....	Rb	Upland.....	0-2	Sands and sandy clays.....	Slow to very slow.....
Ruston fine sandy loam:					
Nearly level phase.....	Rc	Upland.....	0-2	Interbedded sands, sandy clay, and gravel.....	Medium.....
Gently sloping phase.....	Rd	Upland.....	2-5	Same.....	Medium.....
Eroded gently sloping phase.....	Re	Upland.....	2-5	Same.....	Medium.....
Sloping phase.....	Rf	Upland.....	5-8	Same.....	Medium.....
Eroded sloping phase.....	Rg	Upland.....	5-8	Same.....	Medium.....
Eroded strongly sloping phase.....	Rh	Stream breaks and escarp- ments.....	8-12	Same.....	Medium.....

SUMMARY OF IMPORTANT CHARACTERISTICS—Continued

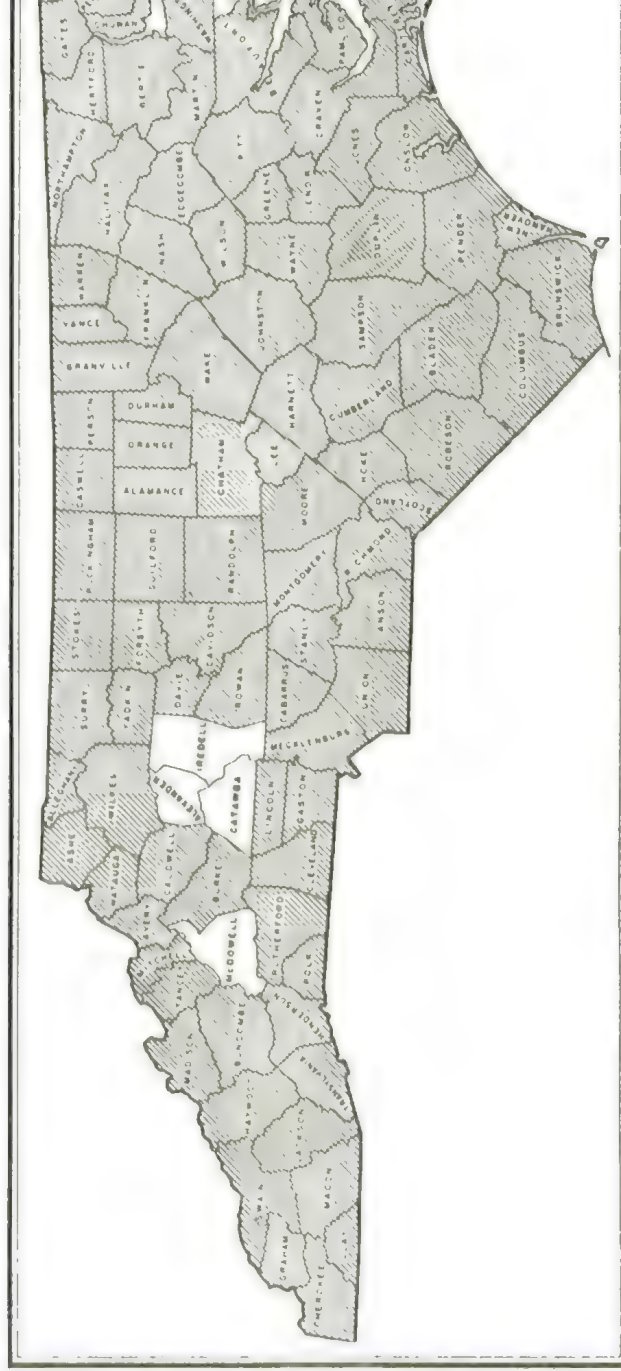
Surface soil			Subsoil		Land capability unit
Color	Consistence	Range in thickness	Color	Consistence	
		<i>Inches</i>			
Dark gray.....	Very friable.....	30-42	Pale yellow.....	Friable.....	IIIs-1.
Dark gray.....	Very friable.....	30-42	Pale yellow.....	Friable.....	IIIs-1.
Dark gray.....	Very friable.....	30-42	Pale yellow.....	Friable.....	IVs-1.
Grayish brown.....	Loose.....	25-30	Light yellowish brown.....	Loose.....	IVs-1.
Gray.....	Very friable.....	36-42	Pale yellow.....	Very friable.....	IIIs-1.
Gray.....	Very friable.....	36-44+	Pale yellow.....	Very friable.....	IIIs-1.
Dark gray.....	Friable.....	8-12	Grayish brown mottled yellowish.	Firm.....	IIIw-2.
Gray.....	Loose.....	6-18	Dark grayish brown.....	Cemented.....	IVw-2.
Very dark gray.....	Friable.....	6-18	Light brownish gray and brownish yellow.	Firm.....	IIw-2.
Very dark gray.....	Friable.....	18-30	Same.....	Friable.....	IIIw-1.
Pale brown.....	Friable.....	14-30	Red.....	Friable to firm.....	IIs-1.
Pale brown.....	Friable.....	18-30	Red.....	Friable to firm.....	IIs-1.
Pale brown and brownish yellow.	Friable.....	0-10	Red.....	Friable to firm.....	IIE-1.
Same.....	Friable.....	0-10	Red.....	Friable to firm.....	IIIE-1.
Dark grayish brown.....	Friable.....	6-12	Strong brown.....	Friable to firm.....	I-1.
Same.....	Friable.....	6-12	Strong brown.....	Friable to firm.....	IIE-1.
Dark brown.....	Friable.....	0-8	Strong brown.....	Friable to firm.....	IIE-1.
Dark gray.....	Friable.....	6-18	Gray, brown, or black.....	Friable to firm.....	IVw-1.
Dark gray.....	Friable.....	6-18	Same.....	Friable.....	IVw-1.
Dark grayish brown.....	Friable.....	8-14	Yellowish brown and gray.....	Friable.....	IIw-3.
Dark gray to very dark gray.....	Very friable.....	12-18	Same.....	Friable.....	IIIw-3.
Dark gray.....	Very friable.....	8-18	Yellowish brown.....	Friable.....	I-1.
Dark gray.....	Very friable.....	12-18	Yellowish brown.....	Friable.....	IIE-1.
Yellowish brown.....	Very friable.....	0-12	Yellowish brown.....	Friable.....	IIE-1.
Dark gray.....	Very friable.....	12-18	Yellowish brown.....	Friable.....	IIIE-1.
Yellowish brown.....	Very friable.....	0-12	Yellowish brown.....	Friable.....	IIIE-1.
Dark gray.....	Very friable.....	18-30	Yellowish brown.....	Friable.....	IIs-1.
Dark gray.....	Very friable.....	18-30	Yellowish brown.....	Friable.....	IIs-1.
Dark gray.....	Very friable.....	18-30	Yellowish brown.....	Friable.....	IIIs-1.
Black.....	Friable.....	12-26	Very dark gray.....	Friable.....	IIIw-4.
Black.....	Friable.....	18-24	Gray.....	Friable.....	IIIw 4.
Very dark gray.....	Loose.....	10-16	Very dark brown.....	Slightly cemented.....	IVw-2.
Very dark gray.....	Very friable.....	10-16	Very dark brown.....	Same.....	IIIw-3.
Black.....	Friable.....	40-60	Gray.....	Friable.....	IVw-1.
Black.....	Friable.....	24-40	Gray.....	Friable.....	IVw-1.
Very dark gray.....	Loose.....	8-12	Gray.....	Loose.....	IVw-2.
Black.....	Loose.....	8-12	Very dark grayish brown.....	Loose.....	IVw-2.
Very dark gray.....	Very friable.....	8-12	Gray.....	Very friable.....	IIIw-3.
Black.....	Friable.....	12-18	Very dark gray.....	Friable.....	IIIw-4.
Black.....	Friable.....	8-24	Dark gray.....	Firm.....	IIIw-4.
Black.....	Friable.....	20-30	Dark gray.....	Firm.....	IIIw-4.
Dark grayish brown to black.....	Friable.....	6-18	Gray, yellowish red, and yellowish brown.	Friable.....	IIw-3.
Same.....	Very friable.....	18-30	Same.....	Friable.....	IIIw-3.
Dark grayish brown.....	Friable.....	6-18	Yellowish red.....	Friable.....	I-1.
Same.....	Friable.....	6-18	Yellowish red.....	Friable.....	IIE-1.
Dark yellowish red.....	Friable.....	0-12	Yellowish red.....	Friable.....	IIE-1.
Dark grayish brown.....	Friable.....	12-18	Yellowish red.....	Friable.....	IIIE-1.
Dark yellowish brown.....	Friable.....	0-12	Yellowish red.....	Friable.....	IIIE-1.
Same.....	Friable.....	0-6	Yellowish red.....	Friable.....	IVE-1.

SOILS OF DUPLIN COUNTY, NORTH CAROLINA:

Soil	Map sym- bol	Topographic position	Domi- nant slope	Parent material	Internal drainage
Ruston loamy fine sand:					
Nearly level thick surface phase.	Rk	Adjacent to stream breaks and terrace escarpments.	0-2	Interbedded sands, sandy clay, and gravel.	Medium.....
Gently sloping thick surface phase.	Rm	Same.....	2-5	Same.....	Medium.....
Sloping thick surface phase.....	Rn	Stream breaks, terrace escarpments, and ridges.	5-8	Same.....	Medium.....
Strongly sloping thick surface phase.	Ro	Upland; stream breaks.....	8-12	Same.....	Medium.....
Rutlege loam.....	Rp	Upland and bays.....	0-2	Plant residue and sands.	Very slow.....
Thick surface phase.....	Rr	Upland and bays.....	0-2	Same.....	Very slow.....
Rutlege loamy fine sand.....	Rs	Upland and bays.....	0-2	Sands.....	Very slow.....
Rutlege mucky loam, thick surface phase.	Rt	Upland and bays.....	0-2	Plant residue and sands.	Very slow.....
St. Johns loamy fine sand.....	Sa	Upland and bays.....	0-2	Sands.....	Very slow.....
Stough fine sandy loam.....	Sb	Stream terraces.....	0-2	Old alluvium.....	Slow to medium.....
Stough loamy fine sand, thick surface phase.	Sc	Stream terraces.....	0-2	Old alluvium.....	Slow to medium.....
Swamp.....	Sd	First bottoms.....	0-2	Recent alluvium.....	Very slow.....
Woodstown fine sandy loam:					
Nearly level phase.....	Wa	Interstream uplands.....	0-2	Sands and sandy clays.	Medium to rapid....
Gently sloping phase.....	Wb	Interstream uplands.....	2-5	Sands and sandy clays.	Medium to rapid....
Woodstown loamy fine sand, nearly level thick surface phase.	Wc	Interstream uplands.....	0-2	Sands and sandy clays.	Medium to rapid....

SUMMARY OF IMPORTANT CHARACTERISTICS—Continued

Surface soil			Subsoil		Land capa- bility unit
Color	Consistence	Range in thick- ness	Color	Consistence	
Dark grayish brown.....	Very friable.....	<i>Inches</i> 18-30	Yellowish red.....	Friable.....	IIs-1.
Same.....	Very friable.....	18-30	Yellowish red.....	Friable.....	IIs-1.
Same.....	Very friable.....	18-30	Yellowish red.....	Friable.....	IIIs-1.
Same.....	Very friable.....	18-30	Yellowish red.....	Friable.....	IVs-1.
Black.....	Very friable.....	5-18	Dark brown.....	Friable, may be cemented.	IVw-1.
Black.....	Very friable.....	18-36	Gray.....	Same.....	IVw-1.
Black.....	Very friable.....	5-8	Gray.....	Same.....	IVw-1.
Black.....	Very friable.....	18-36	Dark gray.....	Friable.....	IVw-1.
Black.....	Very friable.....	0-42	Very dark brown.....	Cemented.....	IVw-1.
Dark grayish brown.....	Friable.....	8-18	Pale yellow and light gray.....	Friable.....	IIw-2.
Same.....	Very friable.....	18-30	Same.....	Friable.....	IIIw-3.
Dark gray.....	Friable.....	6-18	Gray.....	Friable.....	VIIw-1.
Very dark gray.....	Friable.....	8-18	Light yellowish brown.....	Friable.....	IIw-1.
Very dark gray.....	Friable.....	12-18	Same.....	Friable.....	IIc-2.
Very dark gray.....	Very friable.....	18-30	Same.....	Friable.....	IIs-1.



Areas surveyed in North Carolina shown by shading.

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at <http://offices.sc.egov.usda.gov/locator/app>.

Nondiscrimination Statement

Nondiscrimination Policy

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, whether all or part of an individual's income is derived from any public assistance program, or protected genetic information. The Department prohibits discrimination in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

To File an Employment Complaint

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (<http://directives.sc.egov.usda.gov/33081.wba>) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to program_intake@usda.gov.

Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for

program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

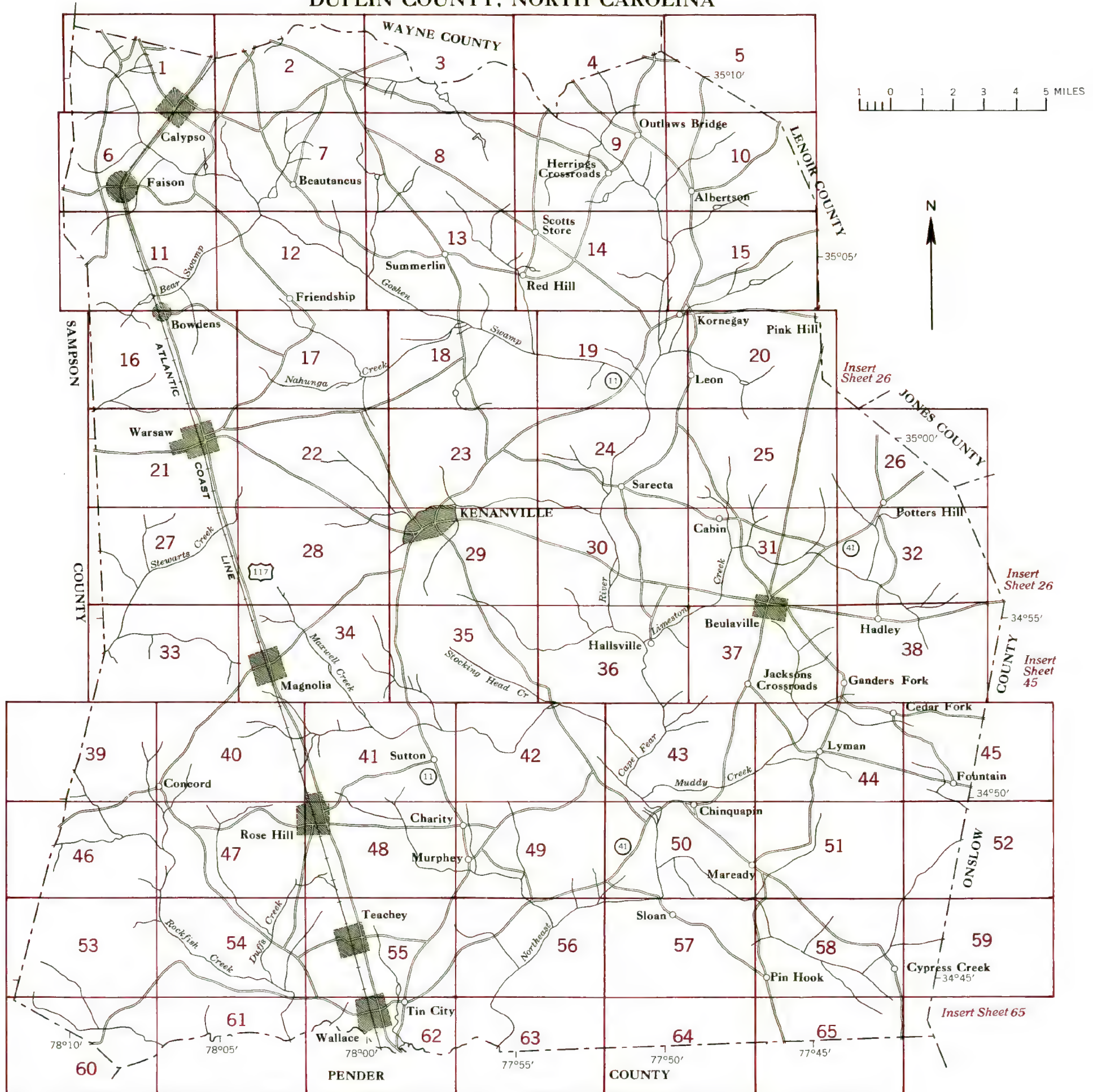
Supplemental Nutrition Assistance Program

For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (<http://directives.sc.egov.usda.gov/33085.wba>).

All Other Inquiries

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (<http://directives.sc.egov.usda.gov/33086.wba>).

INDEX TO MAP SHEETS
DUPLIN COUNTY, NORTH CAROLINA



SOILS LEGEND

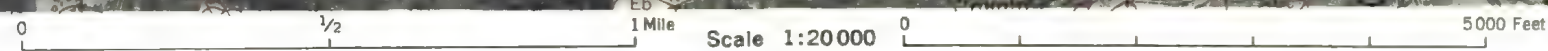
SYMBOL	NAME	SYMBOL	NAME
Ba	Bayboro loam	Ma	Magnolia fine sandy loam, eroded gently sloping phase
Bb	Bladen fine sandy loam	Mb	Magnolia fine sandy loam, eroded sloping phase
Bc	Bladen silt loam	Mc	Magnolia loamy fine sand, nearly level thick surface phase
Ca	Caroline fine sandy loam, gently sloping phase	Md	Magnolia loamy fine sand, gently sloping thick surface phase
Cb	Caroline fine sandy loam, eroded gently sloping phase	Me	Marlboro fine sandy loam, nearly level phase
Cc	Caroline fine sandy loam, sloping phase	Mf	Marlboro fine sandy loam, gently sloping phase
Cd	Caroline fine sandy loam, eroded sloping phase	Mg	Marlboro fine sandy loam, eroded gently sloping phase
Ce	Caroline fine sandy loam, strongly sloping phase	Mh	Mixed alluvial land, poorly drained
Cf	Caroline and Lakeland soils, gently sloping phases	Mk	Mixed local alluvial land
Cg	Caroline and Lakeland soils, sloping phases	Mm	Myatt fine sandy loam
Ch	Caroline and Lakeland soils, strongly sloping phases	Mn	Myatt loamy fine sand
Ck	Coxville fine sandy loam	Na	Norfolk fine sandy loam, nearly level phase
Cm	Coxville fine sandy loam, sandy clay subsoil phase	Nb	Norfolk fine sandy loam, gently sloping phase
Cn	Craven fine sandy loam, nearly level phase	Nc	Norfolk fine sandy loam, eroded gently sloping phase
Co	Craven fine sandy loam, gently sloping phase	Nd	Norfolk fine sandy loam, sloping phase
Cp	Craven fine sandy loam, eroded gently sloping phase	Ne	Norfolk fine sandy loam, eroded sloping phase
Cr	Craven fine sandy loam, eroded sloping phase	Nf	Norfolk loamy fine sand, nearly level thick surface phase
Da	Dragston fine sandy loam	Ng	Norfolk loamy fine sand, gently sloping thick surface phase
Db	Dragston loamy fine sand, thick surface phase	Nh	Norfolk loamy fine sand, sloping thick surface phase
Dc	Dunbar fine sandy loam	Oa	Okenee fine sandy loam
Dd	Duplin fine sandy loam, nearly level phase	Ob	Okenee loam
De	Duplin fine sandy loam, gently sloping phase	Oc	Ona fine sand
Ea	Eustis loamy fine sand, nearly level phase	Od	Ona loamy fine sand
Eb	Eustis loamy fine sand, gently sloping phase	Pa	Pamlico muck
Fa	Fallsington fine sandy loam	Pb	Pamlico muck, shallow phase
Ga	Galestown fine sand, nearly level phase	Pc	Plummer fine sand
Gb	Galestown fine sand, gently sloping phase	Pd	Plummer fine sand, terrace phase
Gc	Goldsboro fine sandy loam, nearly level phase	Pe	Plummer loamy fine sand
Gd	Goldsboro fine sandy loam, gently sloping phase	Pf	Pocomoke loam
Ge	Goldsboro loamy fine sand, nearly level thick surface phase	Pg	Portsmouth loam
Gf	Goldsboro loamy fine sand, gently sloping thick surface phase	Ph	Portsmouth mucky loam
Ia	Immokalee fine sand	Ra	Rains fine sandy loam
Ib	Izagora fine sandy loam	Rb	Rains loamy fine sand, thick surface phase
Ja	Johnston loam	Rc	Ruston fine sandy loam, nearly level phase
Ka	Kalmia fine sandy loam	Rd	Ruston fine sandy loam, gently sloping phase
Kb	Kenansville fine sandy loam, nearly level phase	Re	Ruston fine sandy loam, eroded gently sloping phase
Kc	Kenansville fine sandy loam, gently sloping phase	Rf	Ruston fine sandy loam, sloping phase
Kd	Kenansville loamy fine sand, nearly level thick surface phase	Rg	Ruston fine sandy loam, eroded sloping phase
Ke	Kenansville loamy fine sand, gently sloping thick surface phase	Rh	Ruston fine sandy loam, eroded strongly sloping phase
Kf	Klej fine sand	Rk	Ruston loamy fine sand, nearly level thick surface phase
Kg	Klej fine sand, terrace phase	Rm	Ruston loamy fine sand, gently sloping thick surface phase
Kh	Klej loamy fine sand	Rn	Ruston loamy fine sand, sloping thick surface phase
La	Lakeland fine sand, nearly level phase	Ro	Ruston loamy fine sand, strongly sloping thick surface phase
Lb	Lakeland fine sand, gently sloping phase	Rp	Rutlege loam
Lc	Lakeland fine sand, sloping phase	Rr	Rutlege loam, thick surface phase
Ld	Lakeland fine sand, strongly sloping phase	Rs	Rutlege loamy fine sand
Le	Lakeland fine sand, nearly level shallow phase	Rt	Rutlege mucky loam, thick surface phase
Lf	Lakeland fine sand, gently sloping shallow phase	Sa	St. Johns loamy fine sand
Lg	Lakeland fine sand, sloping shallow phase	Sb	Stough fine sandy loam
Lh	Lakeland fine, terrace phase	Sc	Stough loamy fine sand, thick surface phase
Lk	Lakeland loamy fine sand, nearly level phase	Sd	Swamp
Lm	Lakeland loamy fine sand, gently sloping phase	Wa	Woodstown fine sandy loam, nearly level phase
Ln	Lenoir fine sandy loam	Wb	Woodstown fine sandy loam, gently sloping phase
Lo	Leon fine sand	Wc	Woodstown loamy fine sand, nearly level thick surface phase
Lp	Lynchburg fine sandy loam		
Lr	Lynchburg loamy fine sand, thick surface phase		

Soils surveyed 1954-55 by E. F. Goldston and Dwight L. Kaster, North Carolina Agricultural Experiment Station, and J. A. King, Soil Conservation Service.
Correlation by G. L. Robinson, U. S. Department of Agriculture.

Soil map constructed by Cartographic Division, Soil Conservation Service, USDA, from 1955 aerial photographs. Controlled mosaic based on polyconic projection, 1927 North American datum.



(Sheet 2)



Scale 1:20000

(Sheet 6)



(Sheet 1)

(Sheet 3)



(Sheet 7)



(Sheet 2)

(Sheet 4)



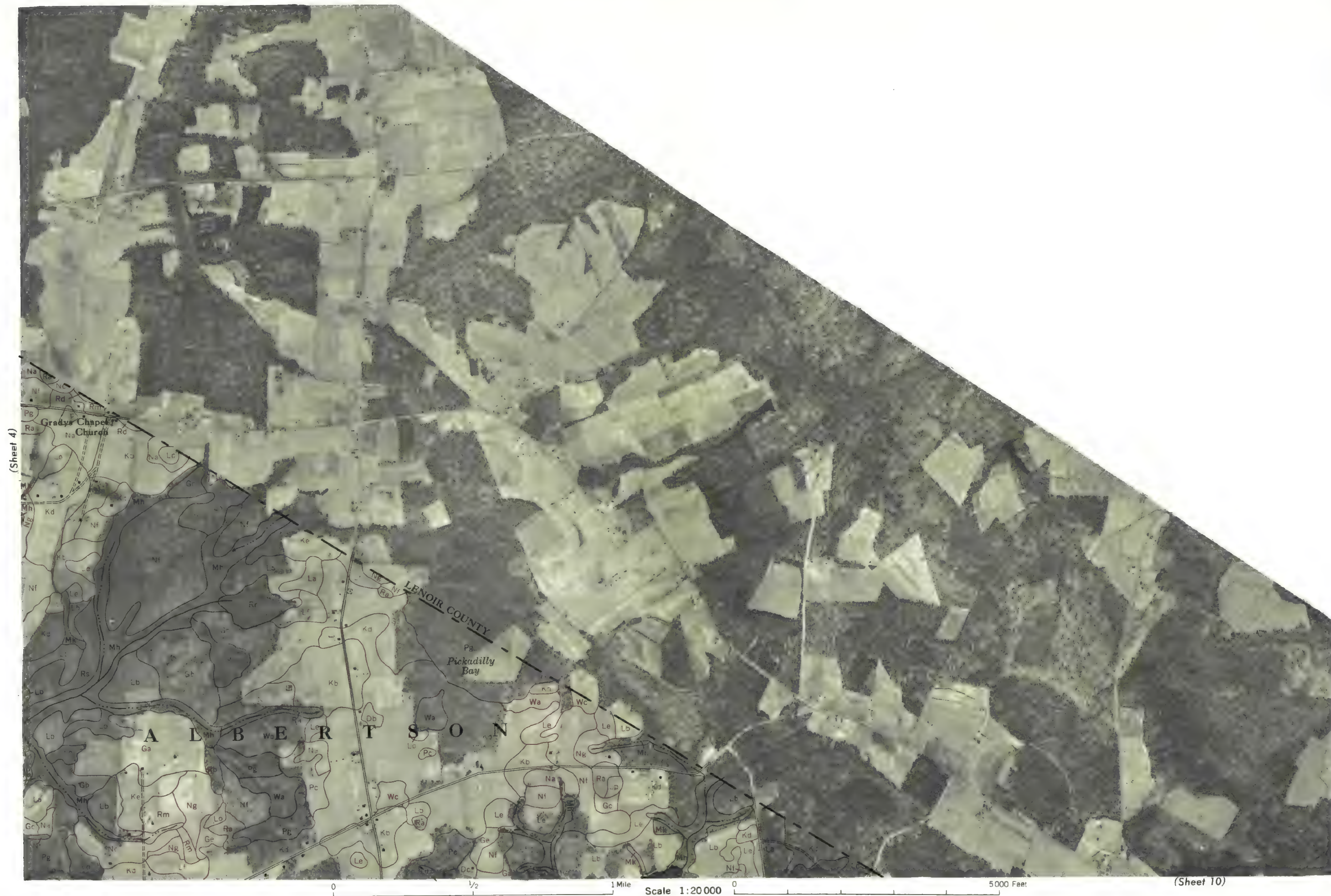
N

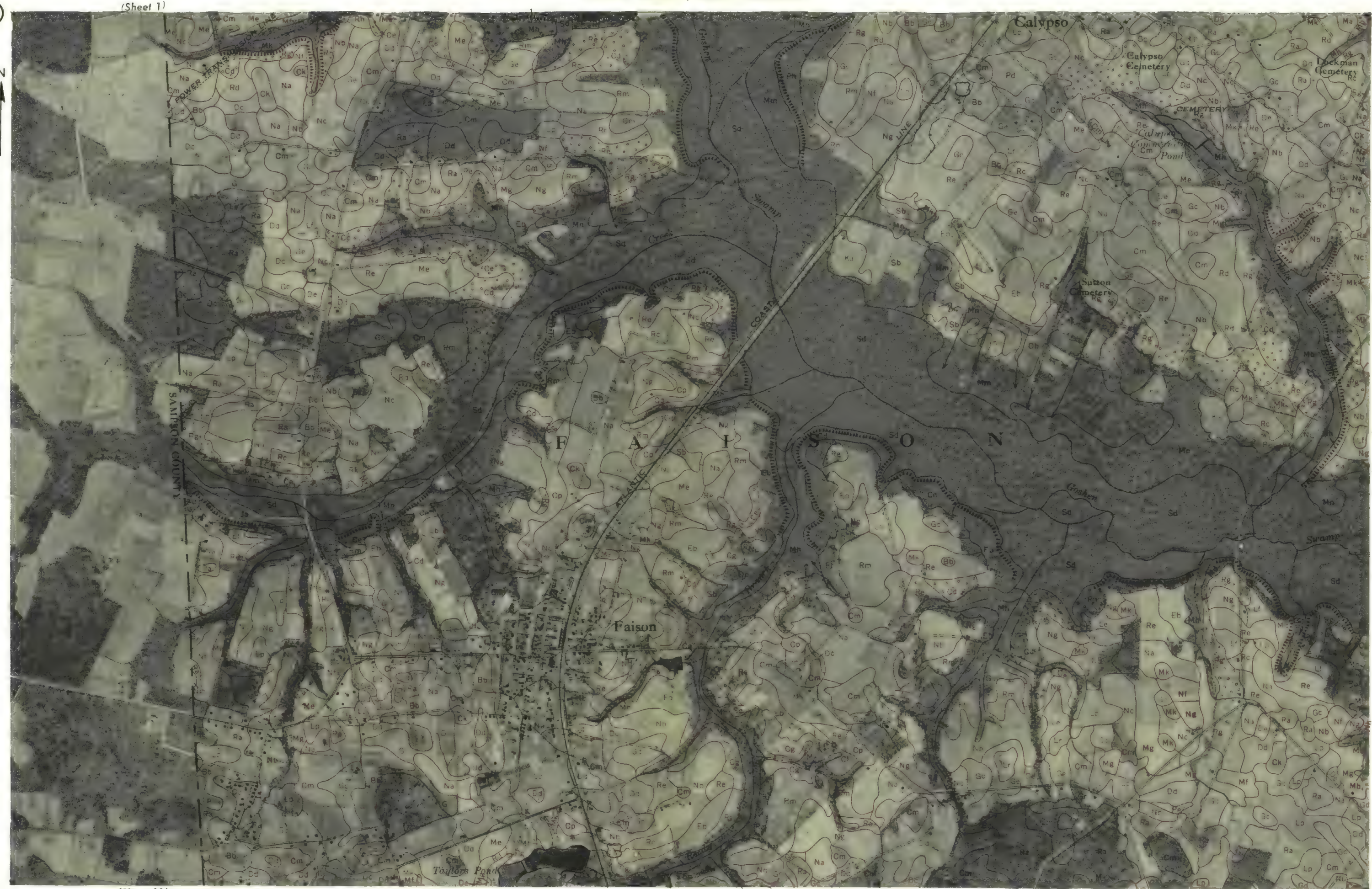
(Sheet 3)

(Sheet 5)

(Sheet 9)

0 1/2 1 Mile Scale 1:20 000 0 5000 Feet





(Sheet 6)

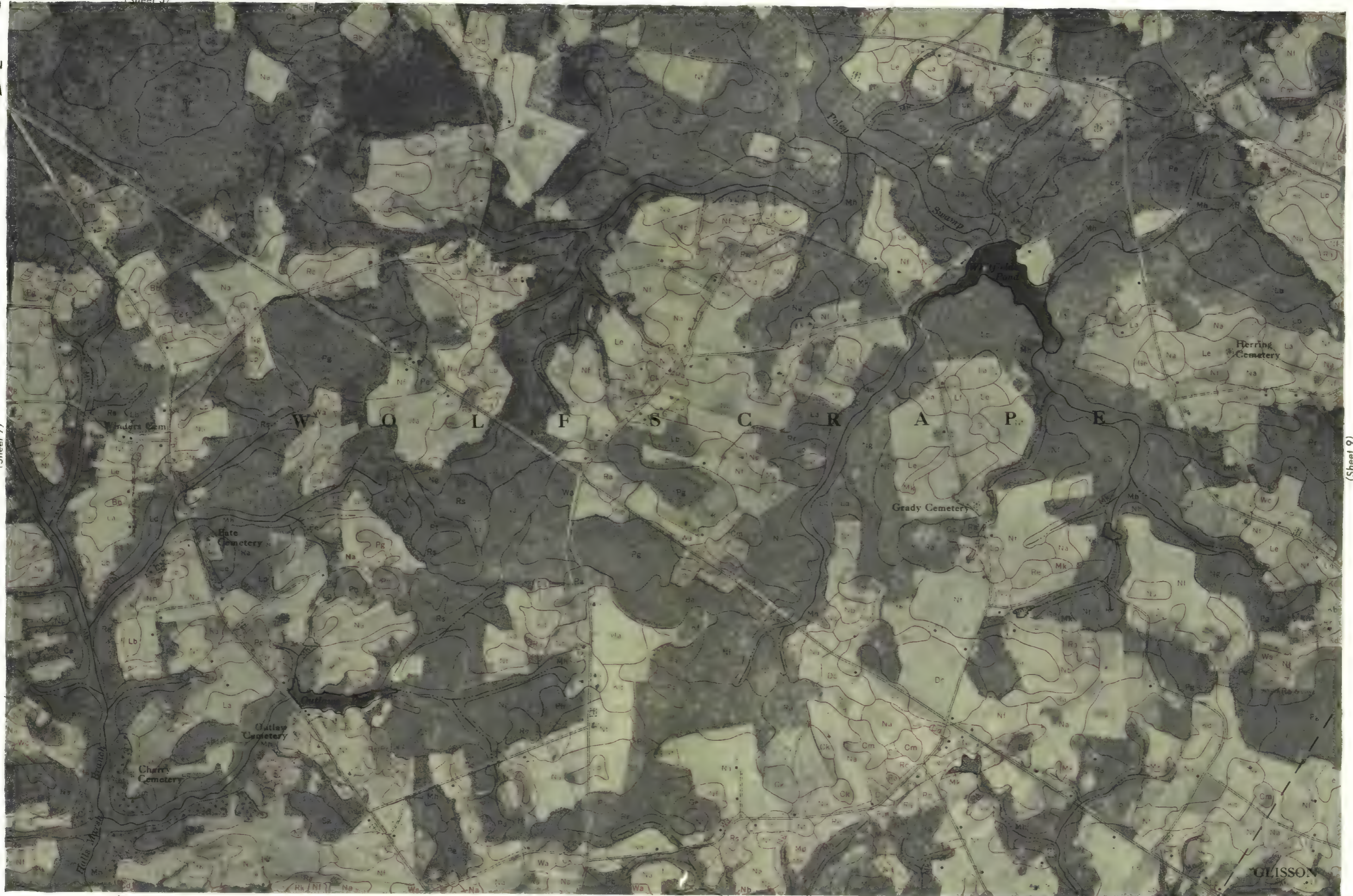
(Sheet 8)





(Sheet 7)

(Sheet 9)

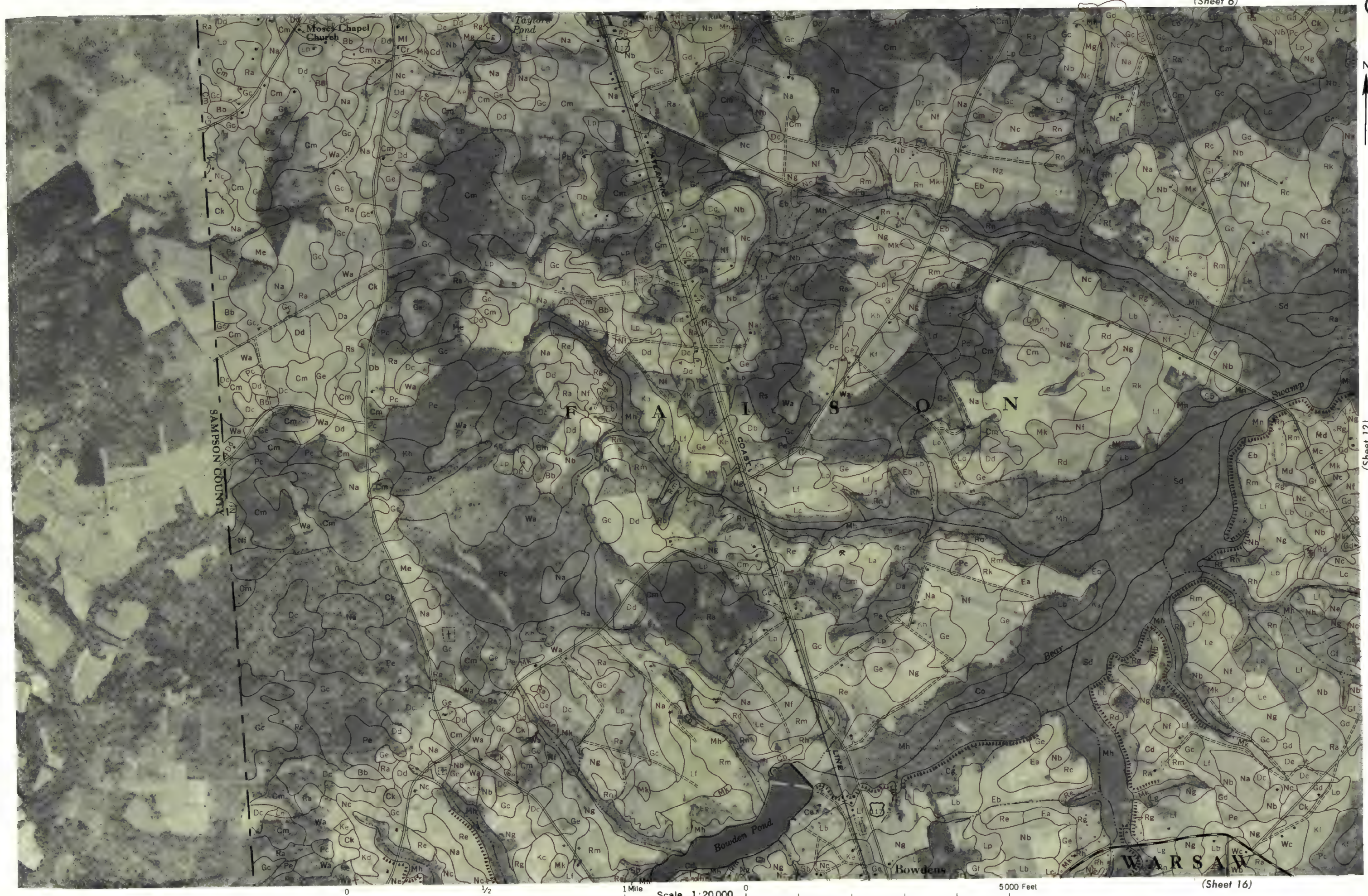






(Sheet 9)









(Sheet 13)

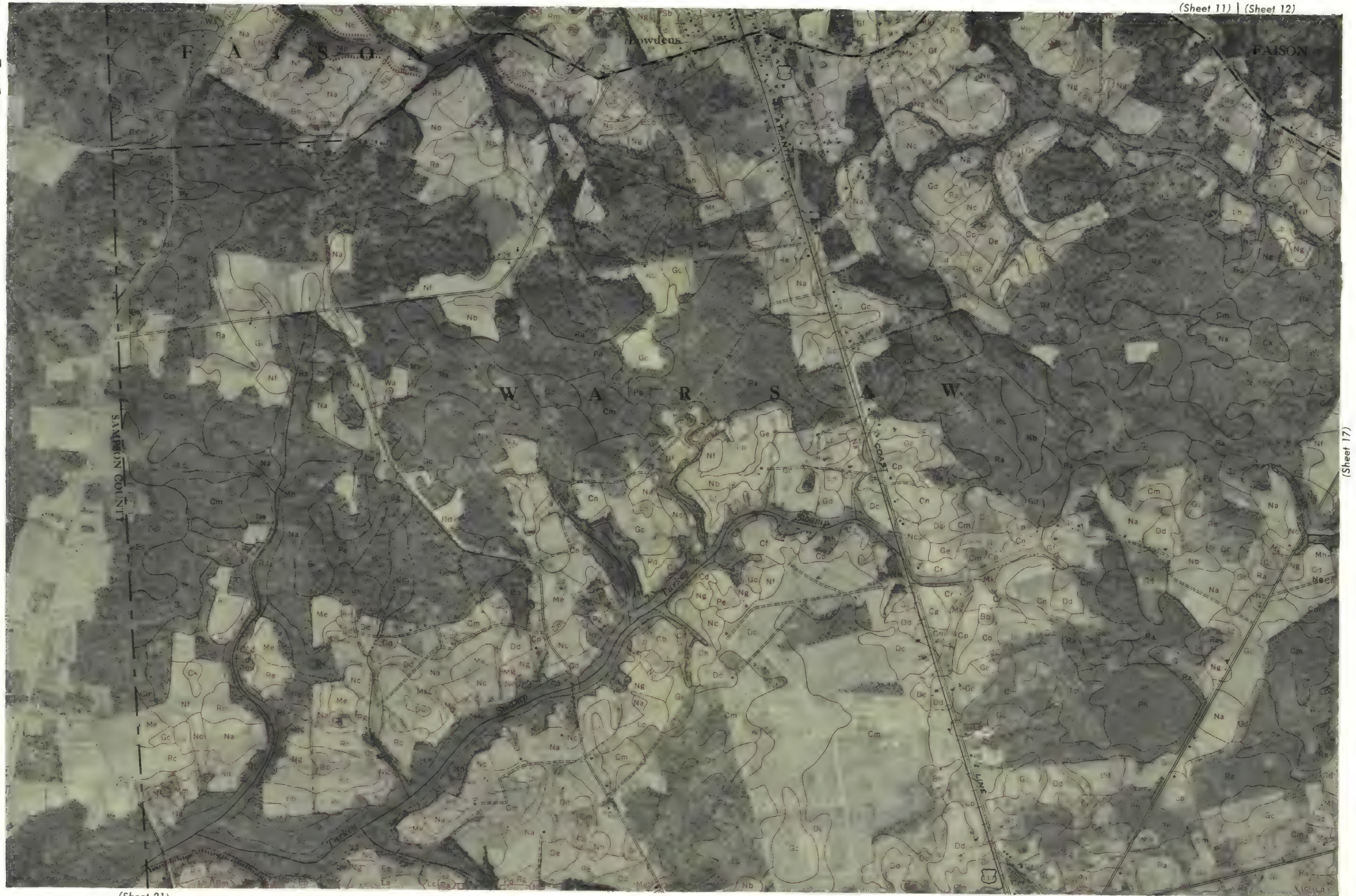
111

(Sheet 18) (Sheet 19)

P

(Sheet 14)





(Sheet 17)



(Sheet 16)

(Sheet 18)

(Sheet 22)

1/2 1 Mile 0 Scale 1:20000 5000 Feet

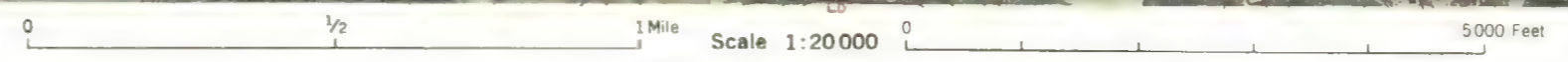


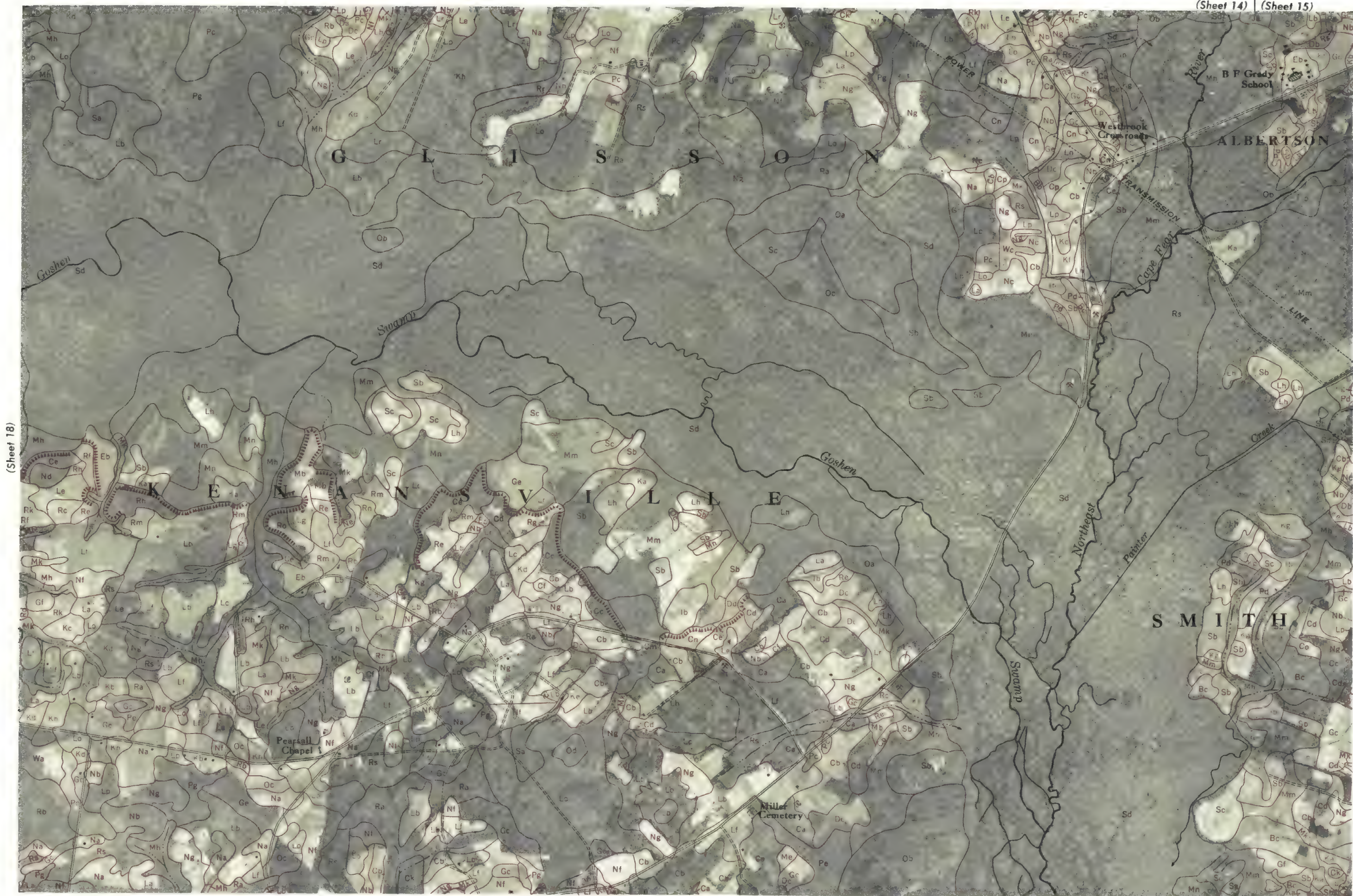
(Sheet 17)

(Sheet 19)



(Sheet 23)





(Sheet 15)

A L B E R T S O N

S M I T H

LENOIR COUNTY

(Sheet 25)

0 1/2 1 Mile Scale 1:20 000 0 5000 Feet

(Inset Sheet 26)



(Sheet 22)

(Sheet 21)

(Sheet 23)

(Sheet 28)





(Sheet 22)

(Sheet 24)



0 1/2 1 Mile Scale 1:20 000 0 5000 Feet

(Sheet 29)



(Sheet 23)

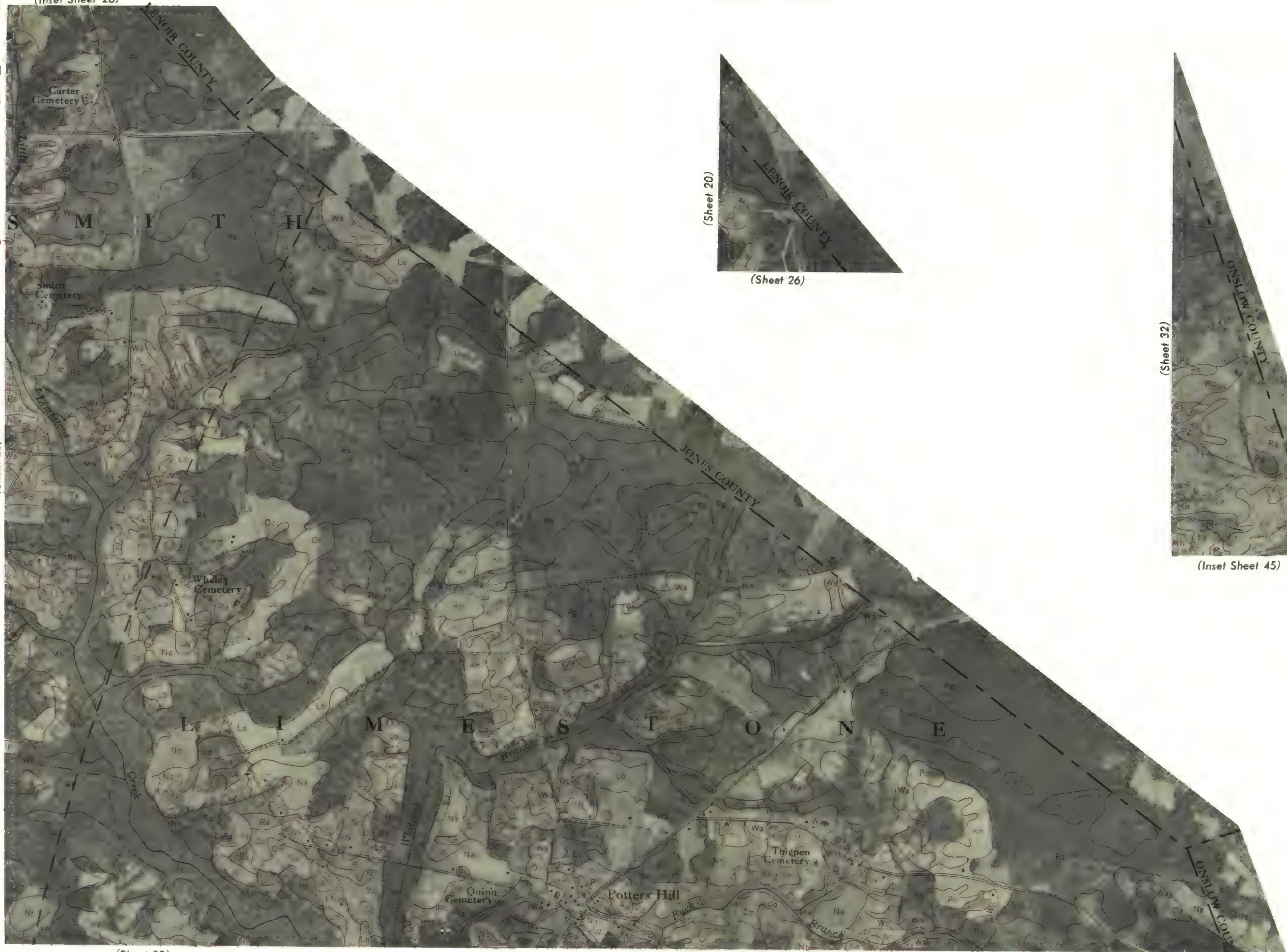


(Sheet 25)





(Sheet 25)



(Sheet 32)



(Sheet 20)

(Sheet 26)

(Sheet 32)

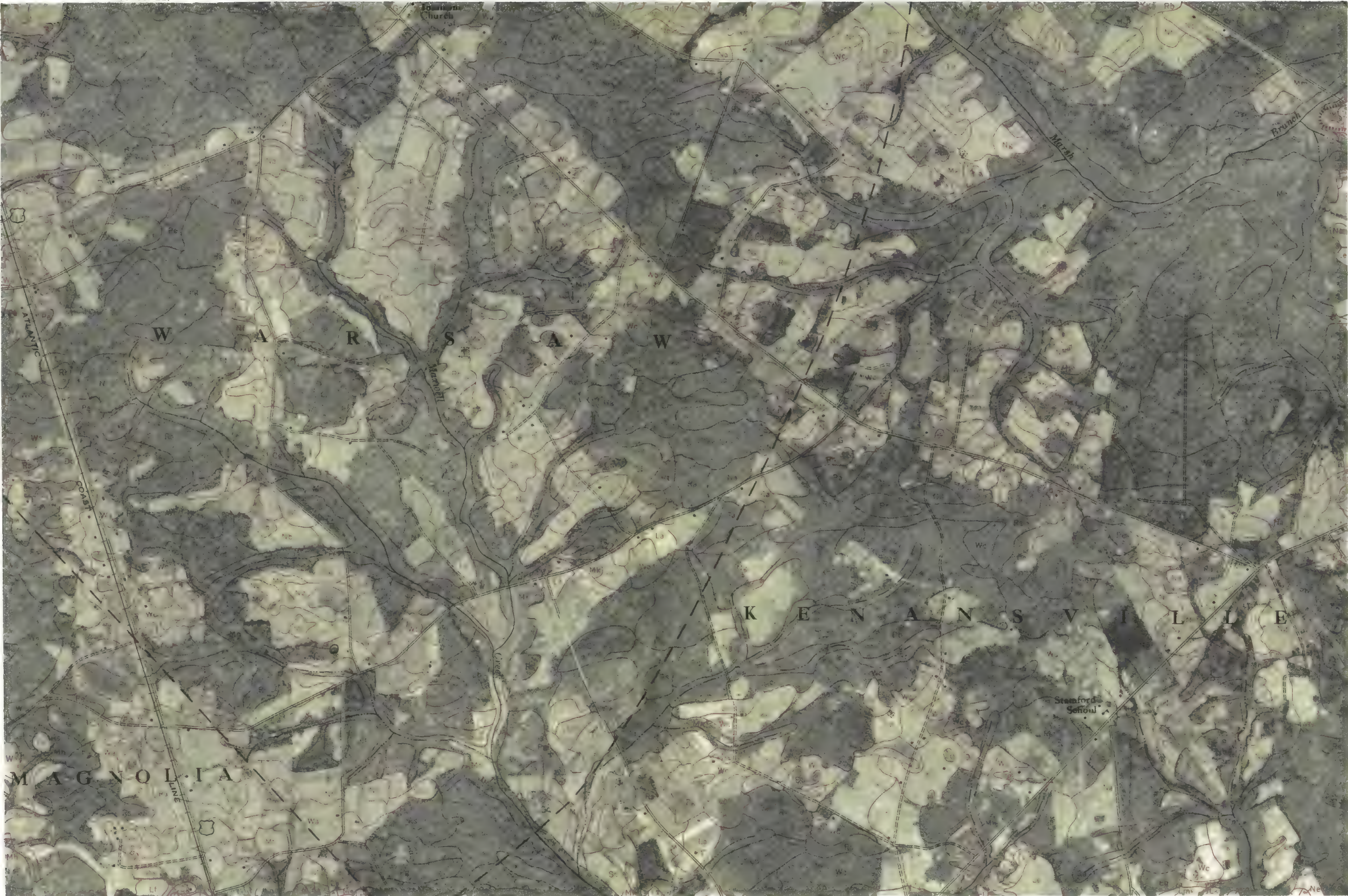
(Inset Sheet 45)



(Sheet 28)



(Sheet 27)



(Sheet 29)

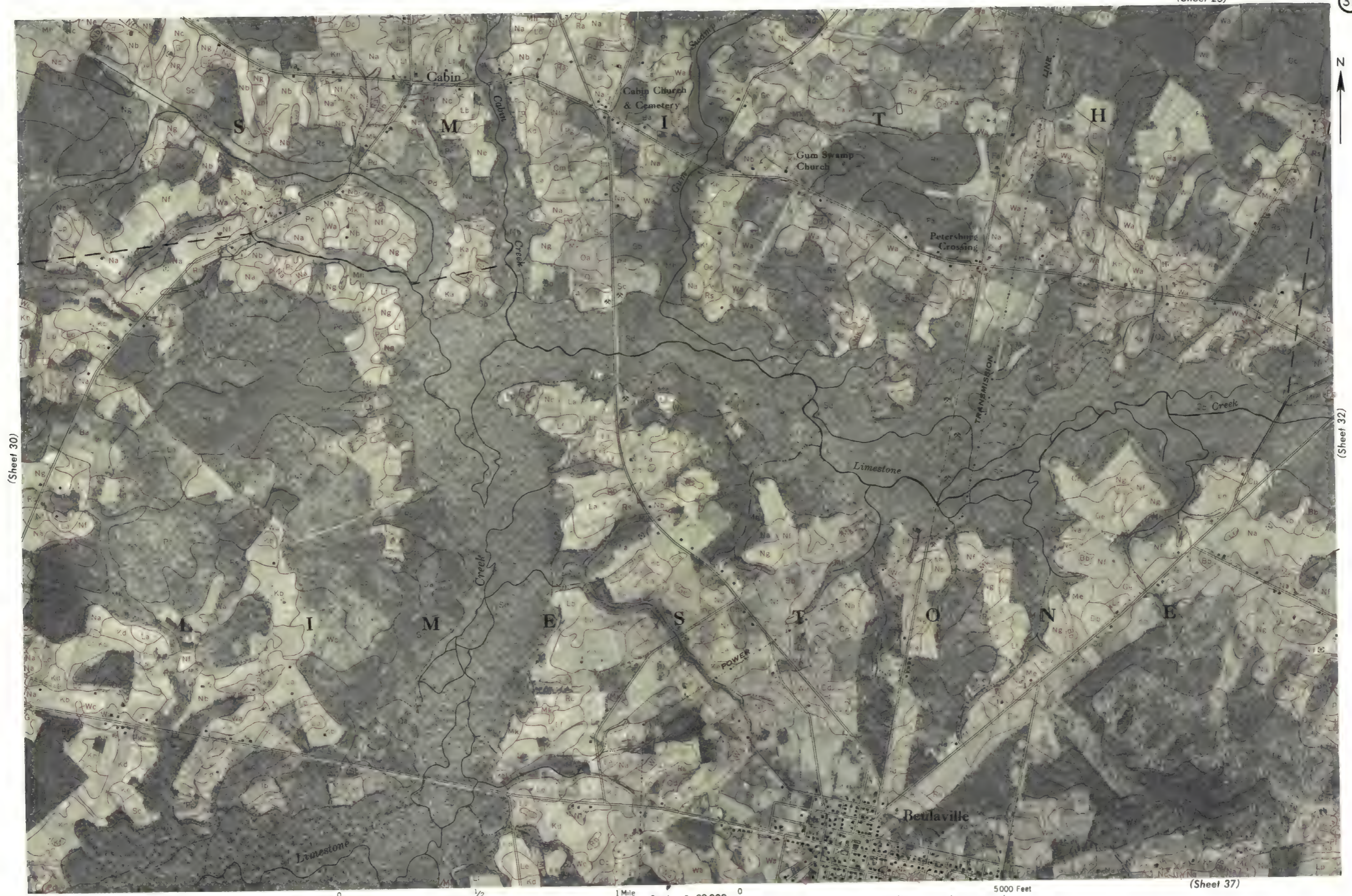
(Sheet 34)



(Sheet 28)

(Sheet 30)

(Sheet 35)



(Sheet 30)

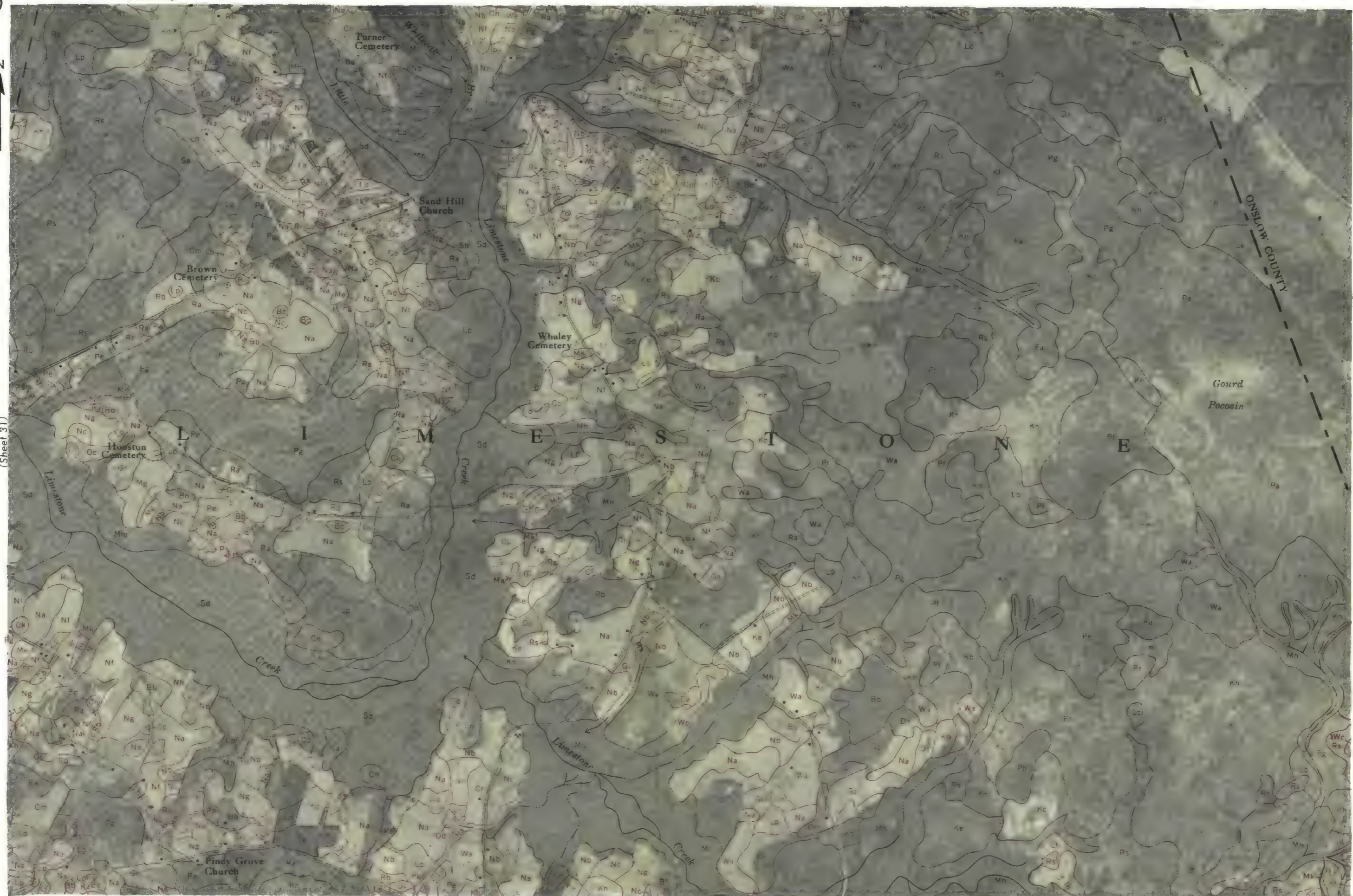
(Sheet 32)

(Sheet 37)

0 1/2 1 Mile Scale 1:20000 0 5000 Feet



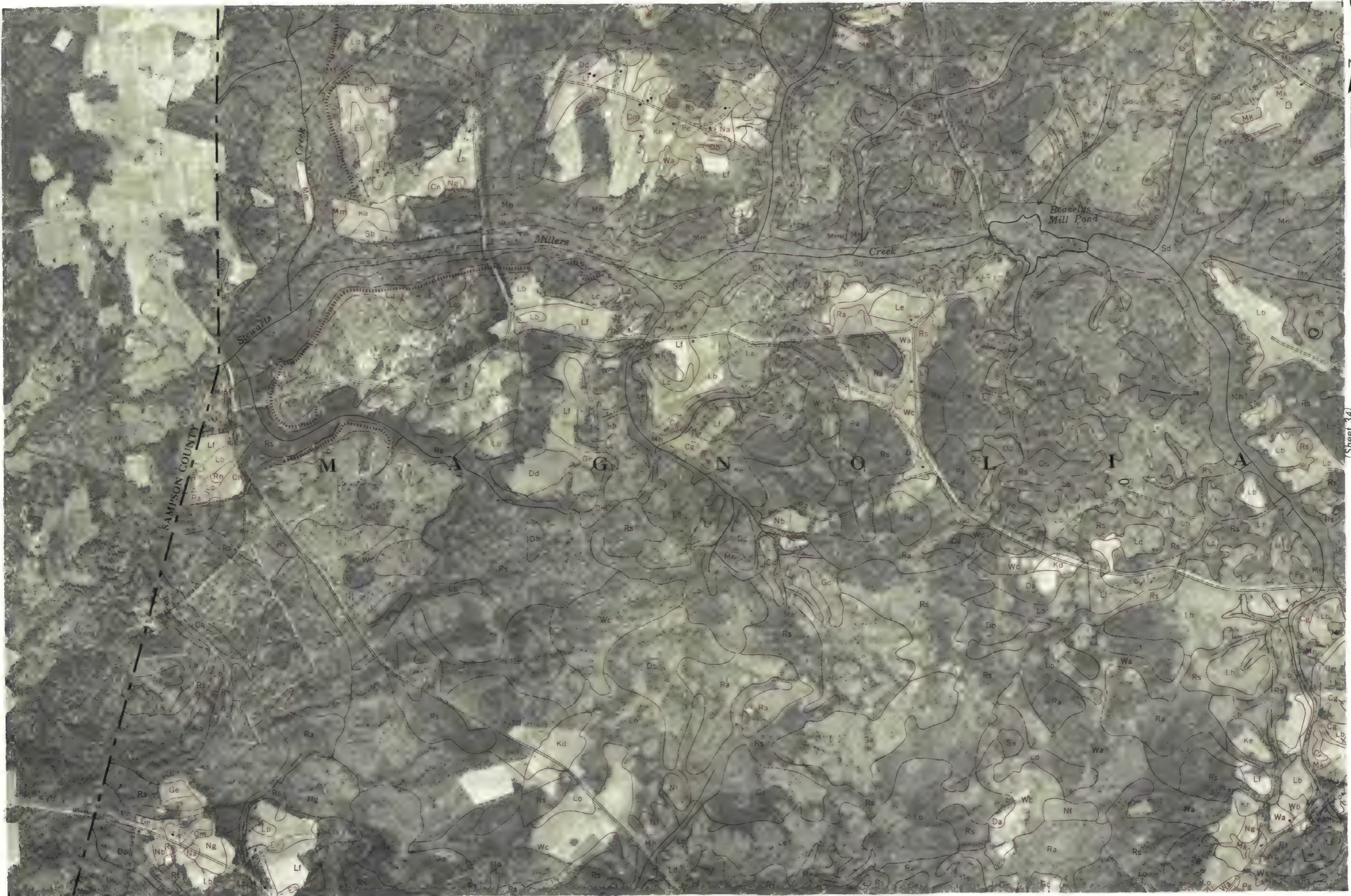
(Sheet 31)



(Sheet 38)

0 1/2 1 Mile Scale 1:20 000 0 5000 Feet

(Inset Sheet 26)



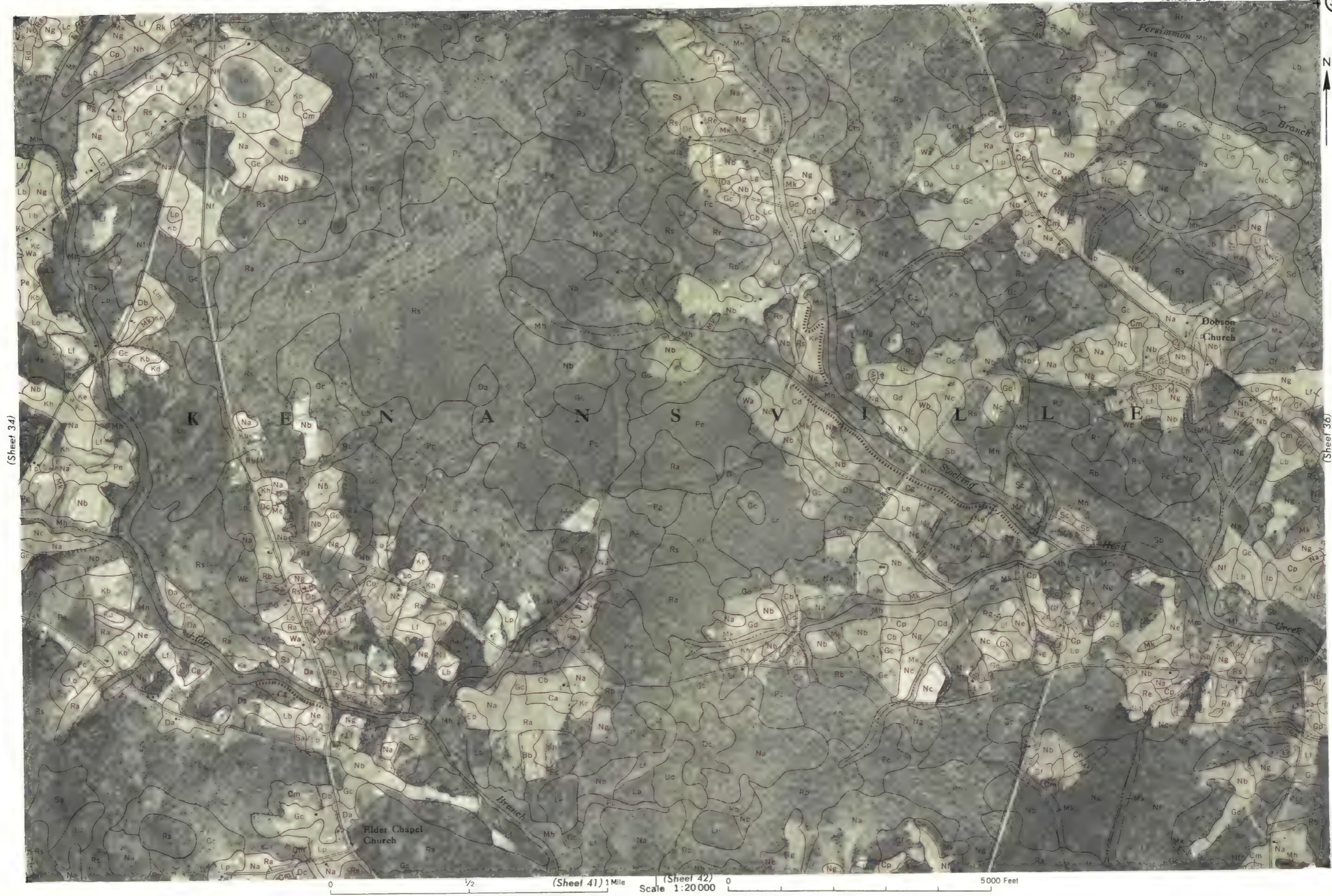
(Sheet 34)



(Sheet 33)



(Sheet 35)





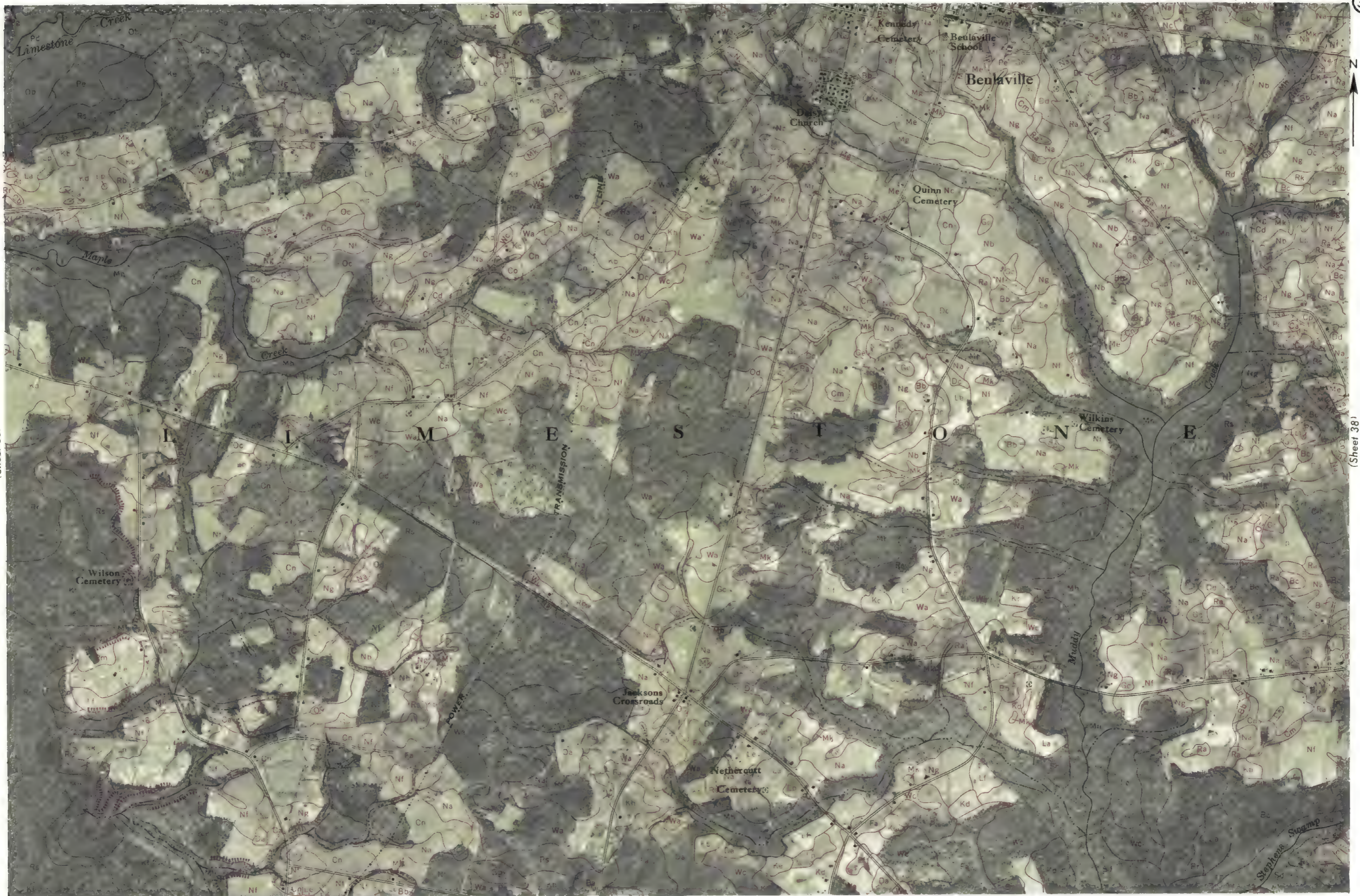
(Sheet 35)

(Sheet 37)



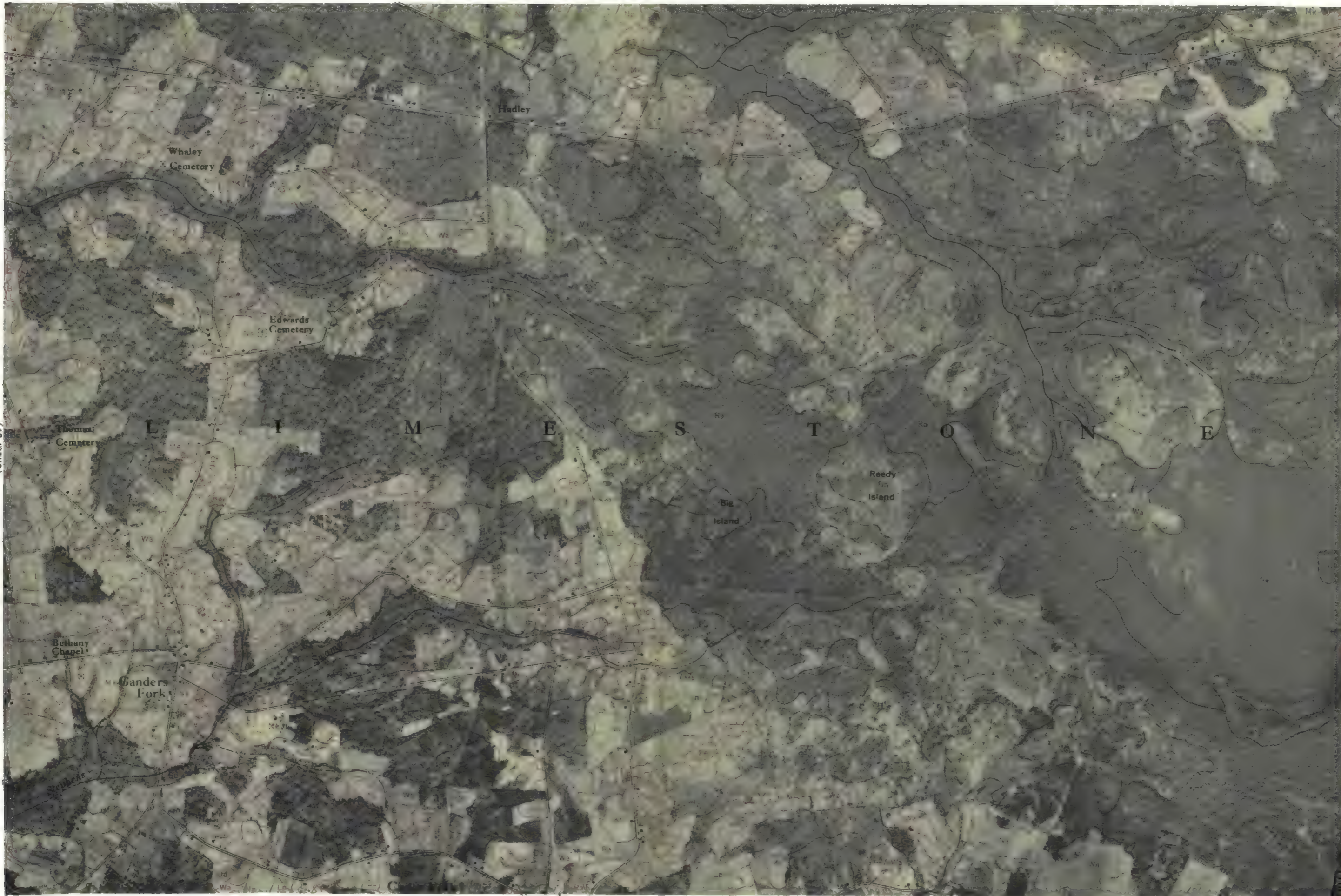
(Sheet 36)

(Sheet 38)





(Sheet 37)



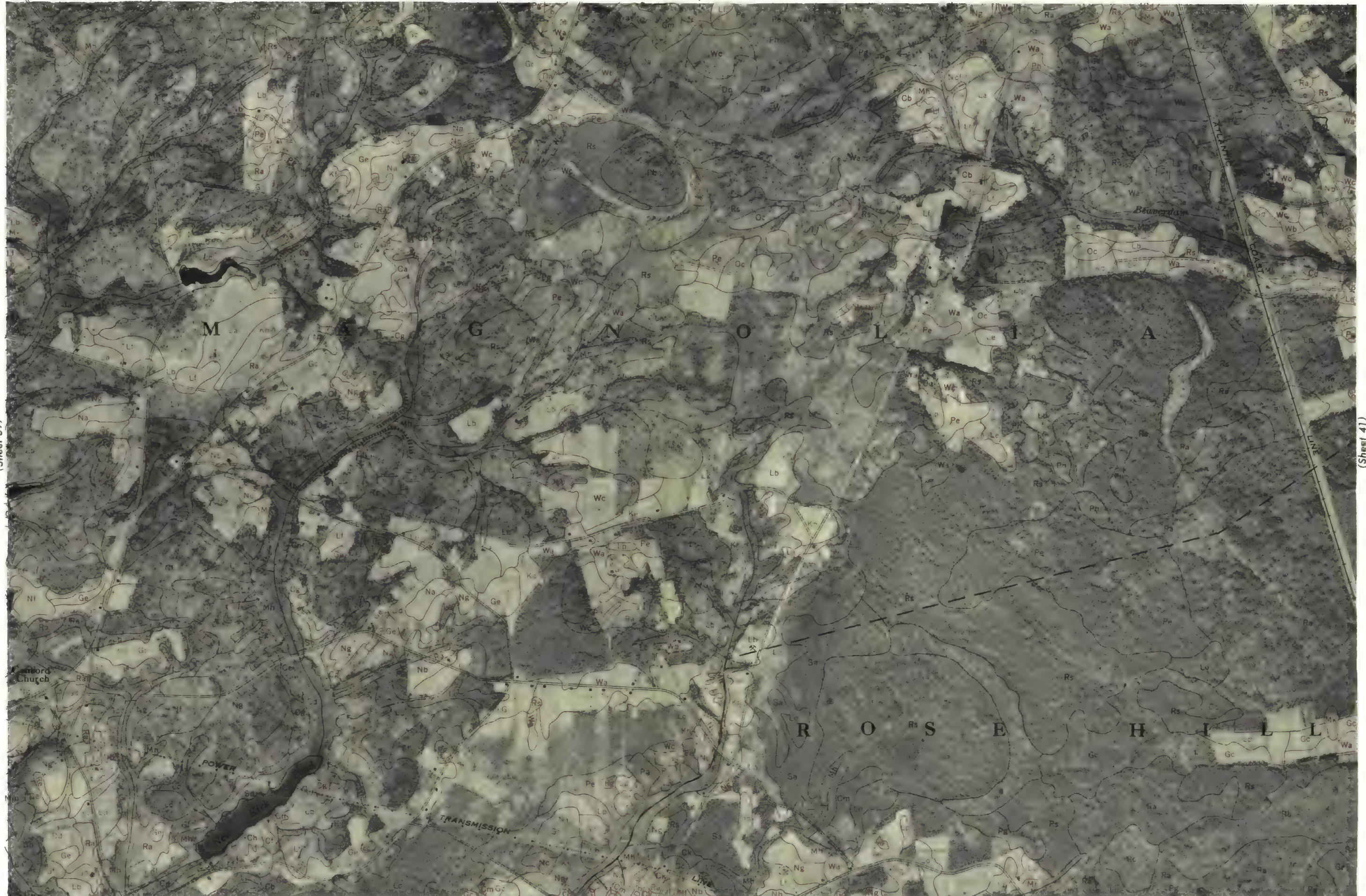
(Inset Sheet 45)



(Sheet 40)



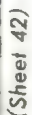
(Sheet 39)



(Sheet 41)

(Sheet 34) | (Sheet 35)

41



Sheet 40)

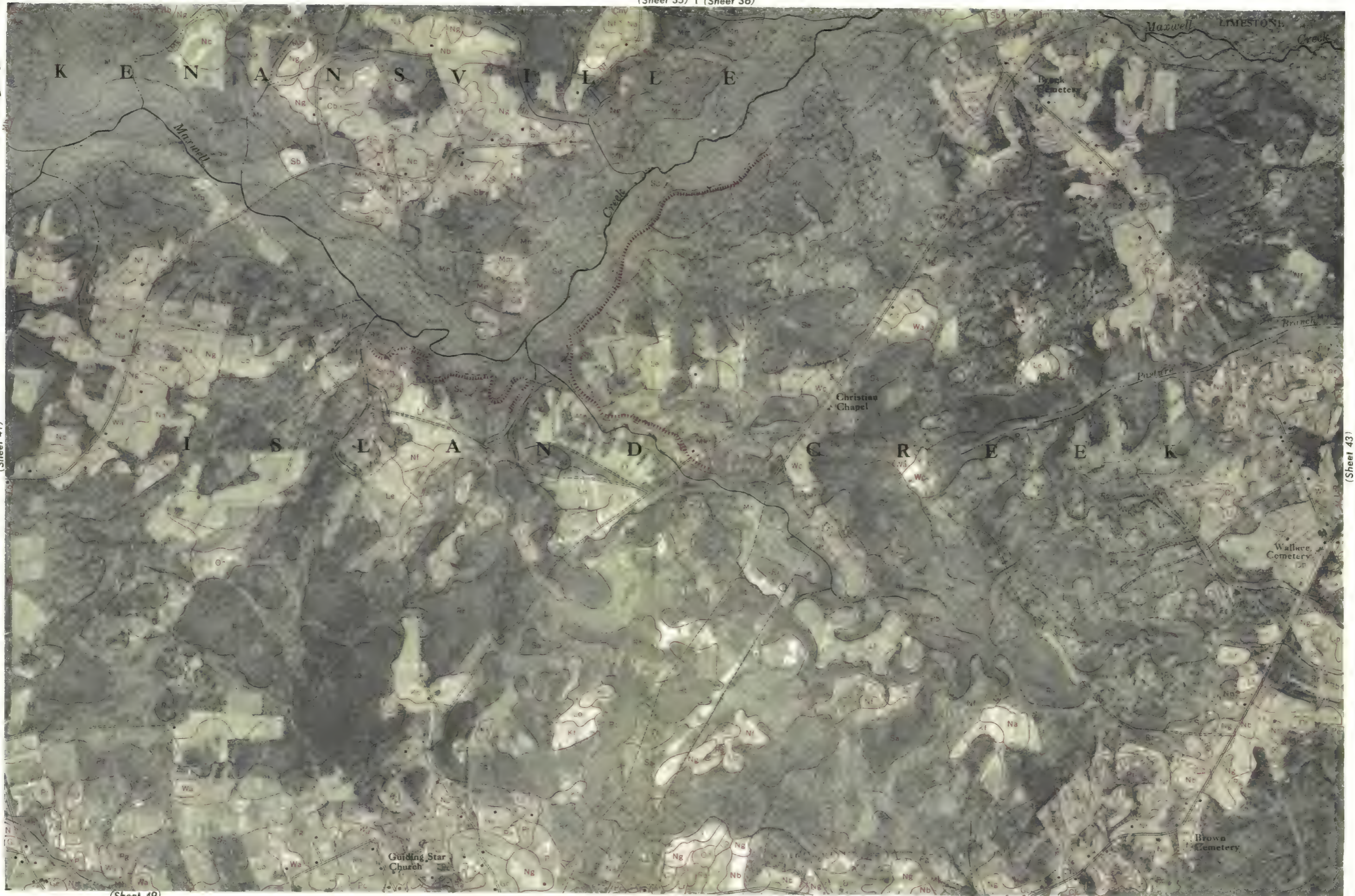
(Sheet 48)

Scale 1:20 000

5000 Feet



(Sheet 41)



(Sheet 43)

(Sheet 49)

0 1/2 1 Mile Scale 1:20000 0 5000 Feet



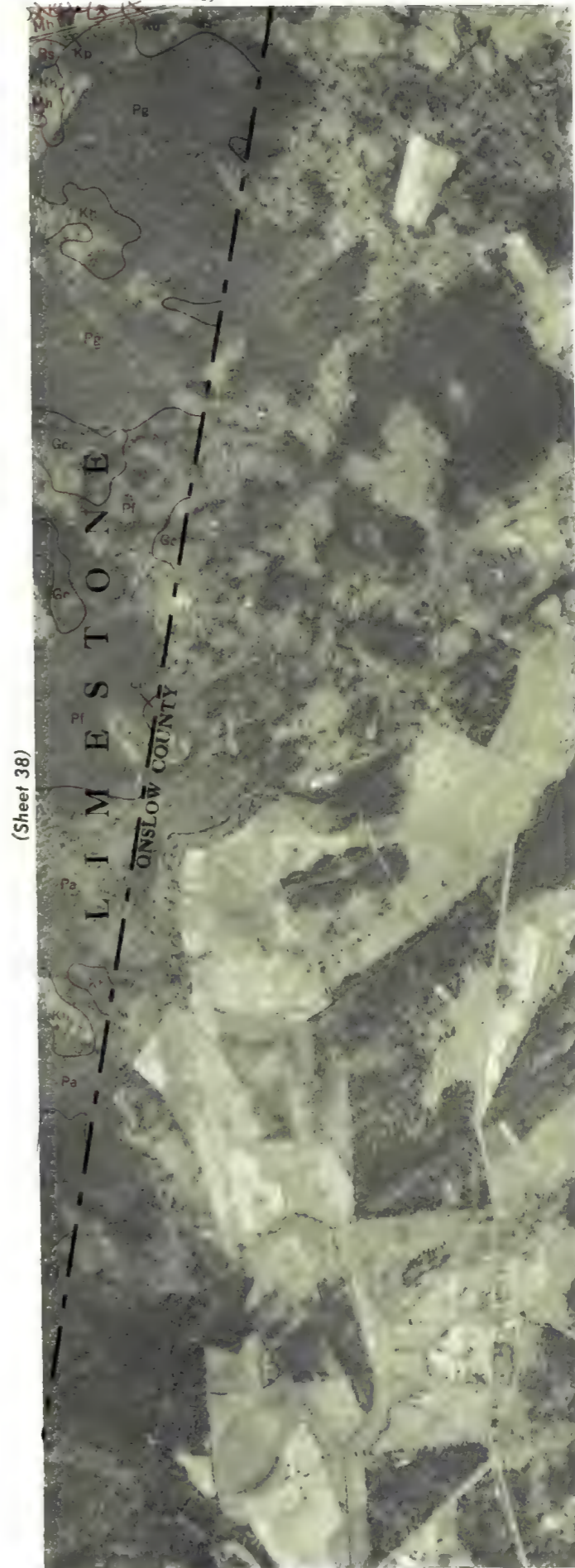


(Sheet 43)



(Sheet 45)

(Sheet 51)





(Sheet 47)

DUPLIN COUNTY, NORTH CAROLINA

(Sheet 40)

47

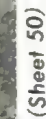


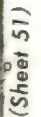


(Sheet 47)



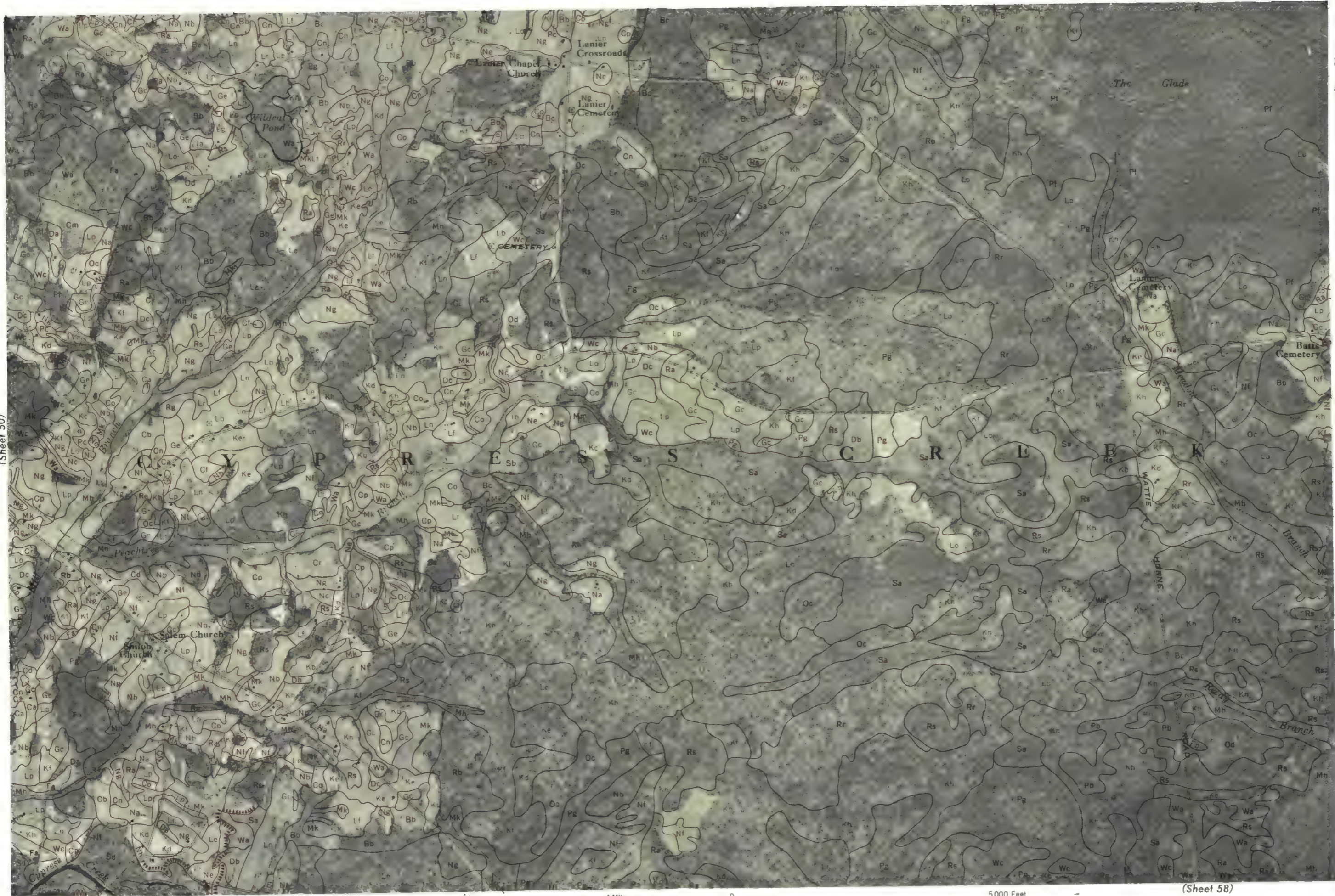
(Sheet 49)





(Sheet 50)

(Sheet 52)



Scale 1:20 000

5000 Feet

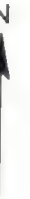
(Sheet 58)



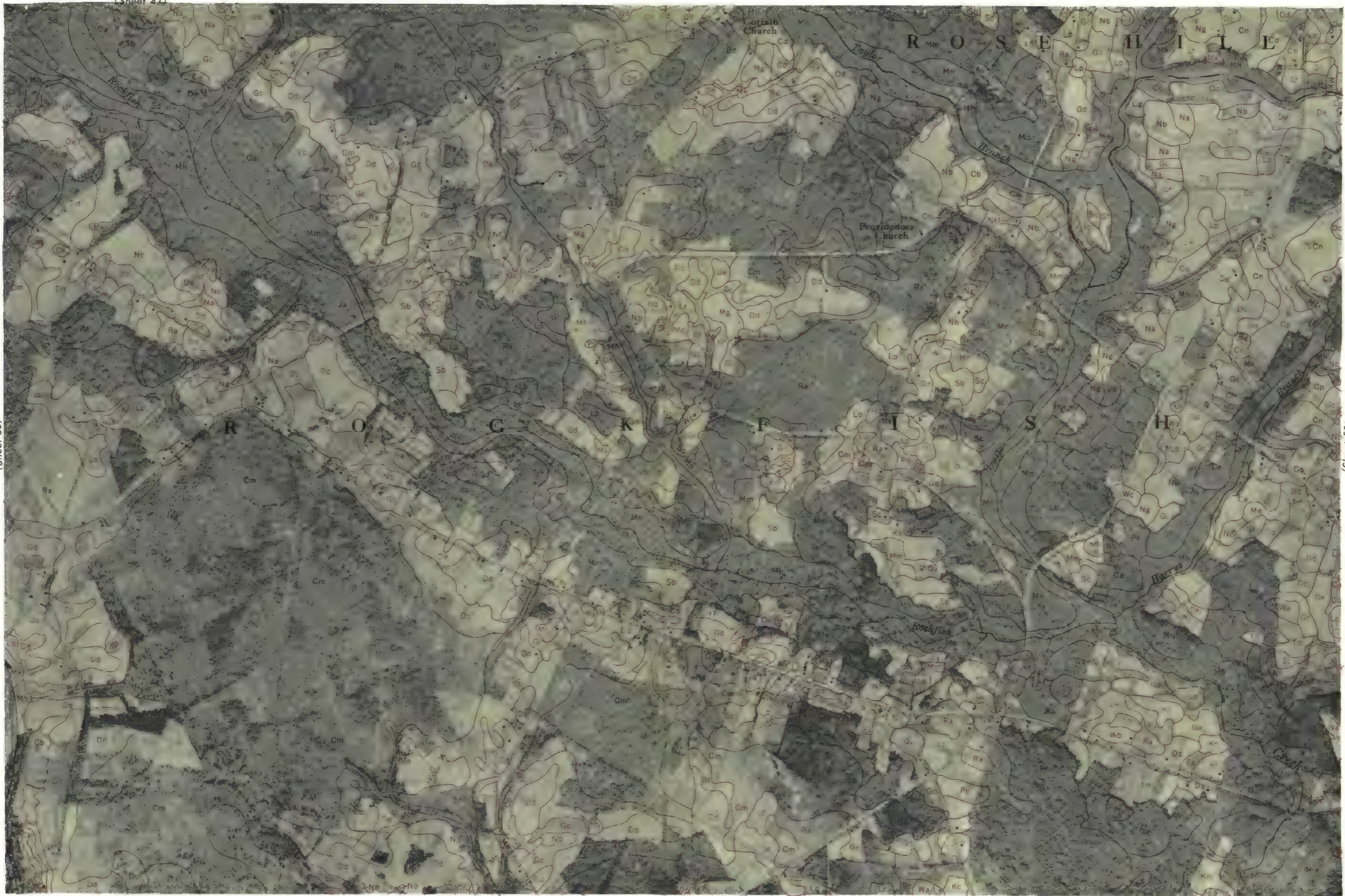
(Sheet 51)



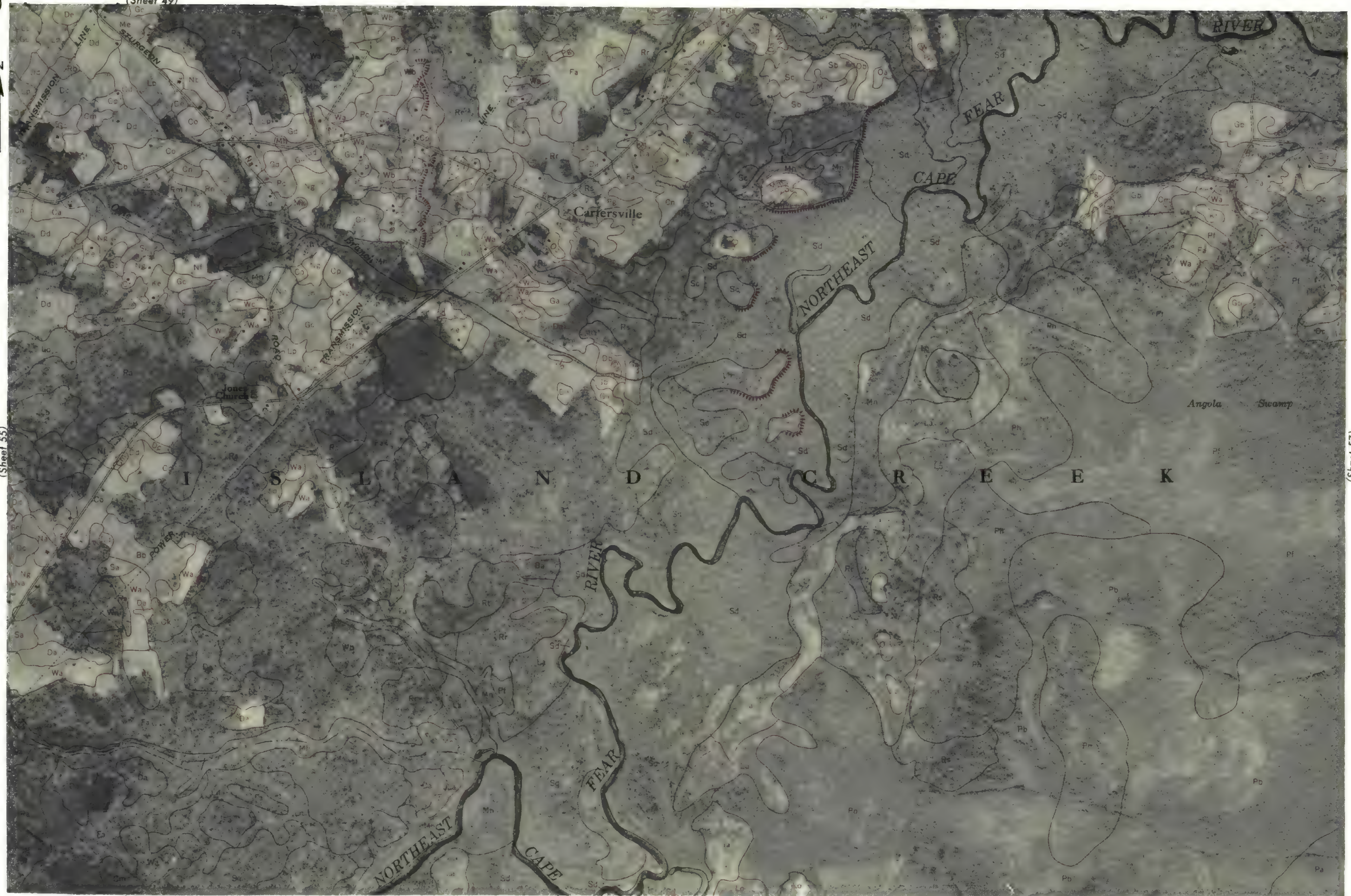
(Sheet 59)



(Sheet 54)







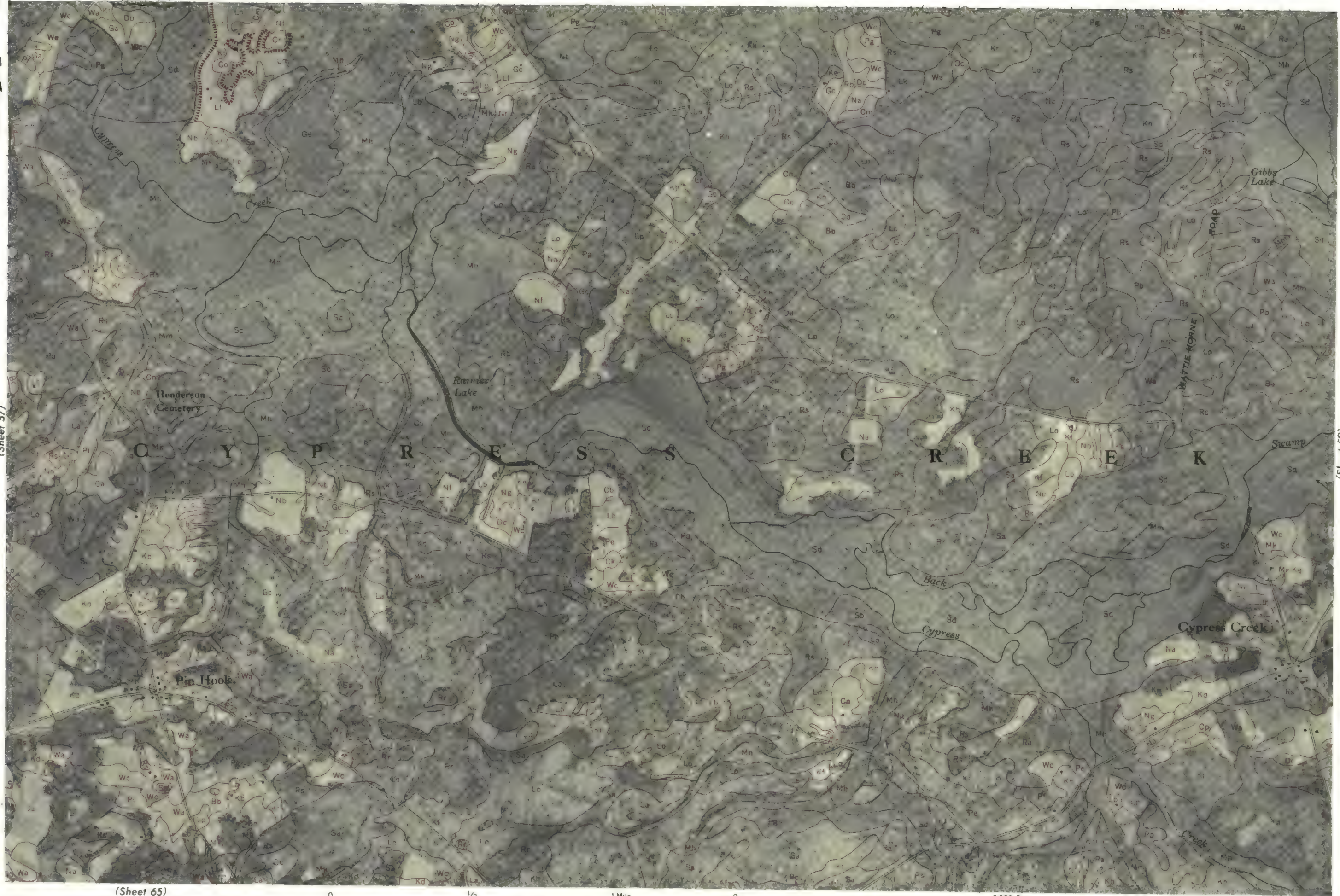


(Sheet 56)

(Sheet 58)



(Sheet 57)



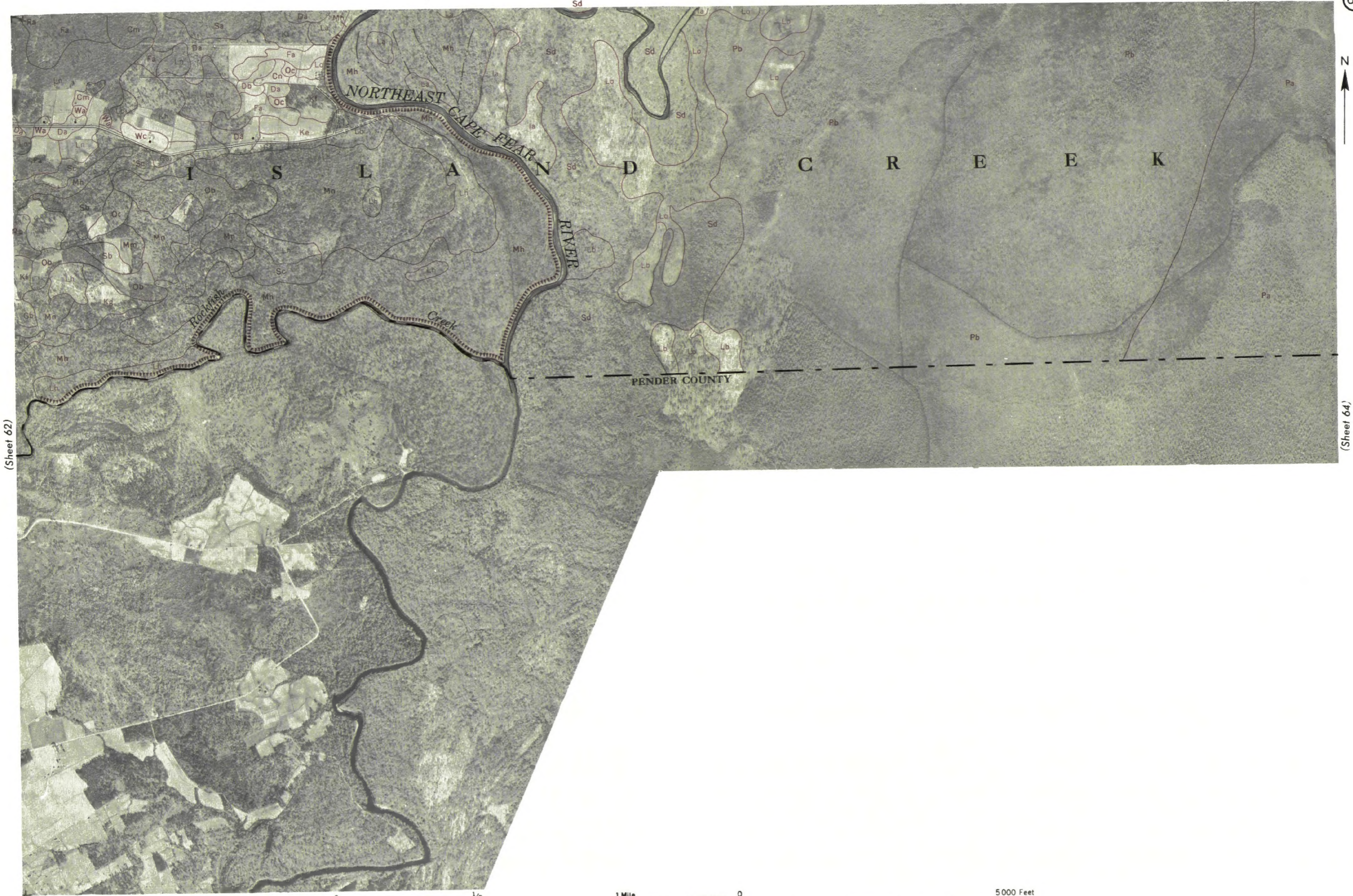
(Sheet 65)





(Sheet 61)





(Sheet 62)

(Sheet 64)



I S L A N D
C R E E K

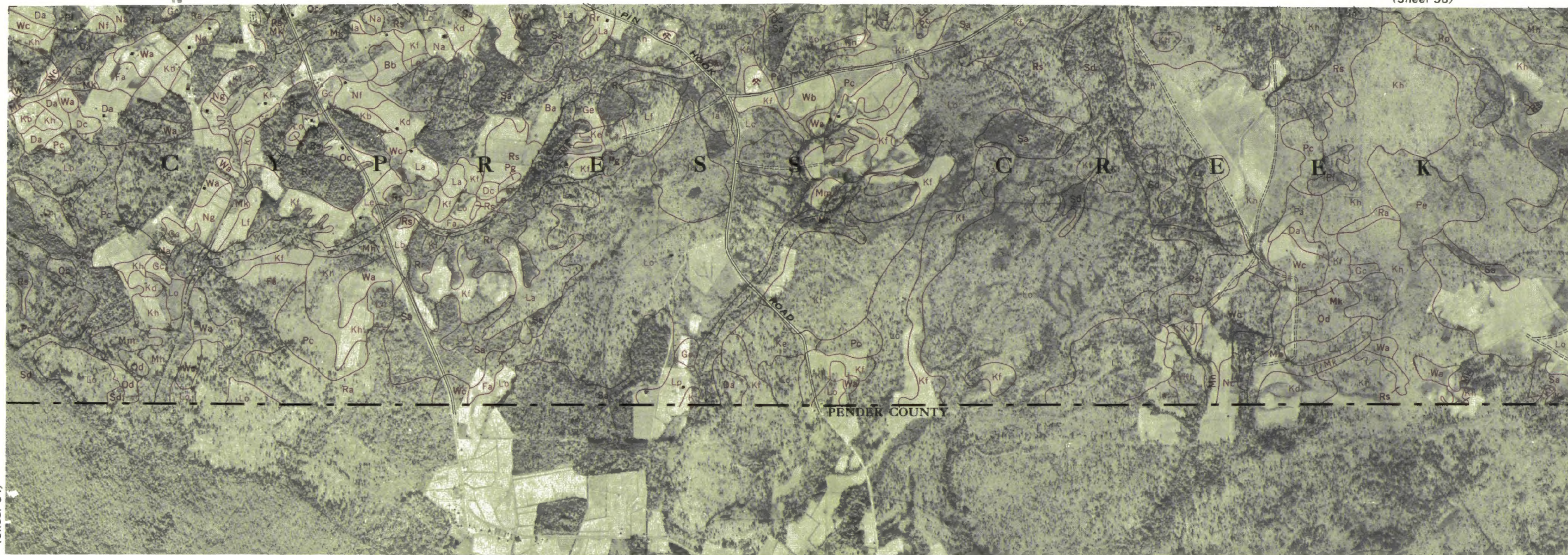
C Y P R E S S C R E E K

Angola Bay

Blue Ridge
Island

PENDER COUNTY

(Sheet 64)



(Inset Sheet 65)

(Sheet 65)



DUPLIN COUNTY, NORTH CAROLINA CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Roads	
Good motor	
Poor motor	
Trail	
Marker, U. S.	
Railroads	
Single track	
Multiple track	
Abandoned	
Bridges and crossings	
Road	
Trail, foot	
Railroad	
Ferry	
Ford	
Grade	
R. R. over	
R. R. under	
Tunnel	
Buildings	
School	
Church	
Station	
Mine and Quarry	
Shaft	
Dump	
Prospect	
Pits, gravel or other	
Power line	
Pipeline	
Cemetery	
Dam	
Levee	
Tank	
Oil well	
Windmill	
Canal lock (point upstream)	

BOUNDARIES

National or state	
County	
Township, civil	
U. S.	
Section	
City (corporate)	
Reservation	
Land grant	

DRAINAGE

Streams	
Perennial	
Intermittent, unclass.	
Intermittent, unsurveyed	
Canals and ditches	
Lakes and ponds	
Perennial	
Intermittent	
Wells	
Springs	
Marsh	
Wet spot	

RELIEF

Escarments	
Bedrock	
Other	
Prominent peaks	
Depressions	
Crossable with tillage implements	
Not crossable with tillage implements	
Contains water most of the time	

SOIL SURVEY DATA

Soil type outline and symbol	
Gravel	
Stones	
Rock outcrops	
Chert fragments	
Clay spot	
Sand spot	
Gumbo or scabby spot	
Made land	
Erosion	
Uneroded spot	
Sheet, moderate	
Sheet, severe	
Gully, moderate	
Gully, severe	
Sheet and gully, moderate	
Wind, moderate	
Wind, severe	
Blowout	
Wind hummock	
Overblown soil	
Gullies	
Crossable with tillage implements	
Not crossable with tillage implements	
Areas of alkali and salts	
Strong	
Moderate	
Slight	
Free of toxic effect	
Sample location	
Saline spot	

Dx

g

g

v

v

*

*

*

*

U

S

SS

G

GG

SG

*

*

*

*

*

*

*

A

M

S

F

26

+